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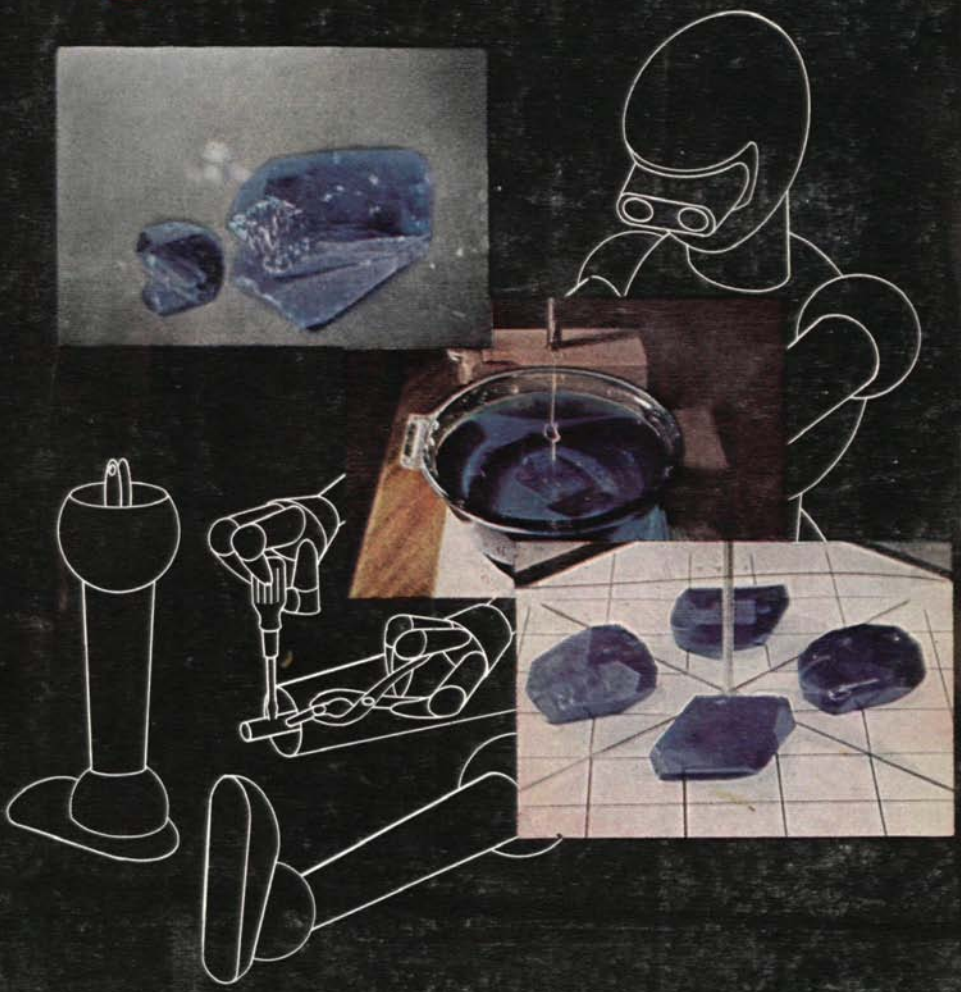

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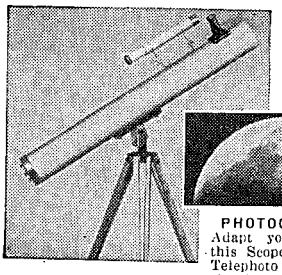

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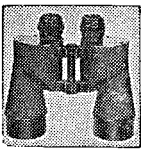

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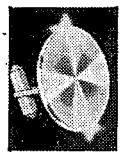

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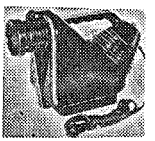

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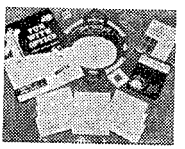

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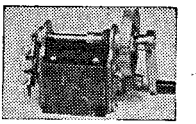

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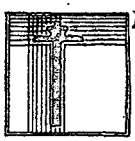
THE TEST



HERE is a deep resentment of being judged by other human beings —that is, when the judgment is negative. Of course, somehow other people's approving judgments don't have the same air of impropriety, of unfairness, about them. We hate being rejected for no reason, or for biased, unfair reasons—for irrational and whimsical cause.

That, at least, is the inevitable human statement—the *claim* that our objection is not to being rejected, but to being *unfairly* rejected.

Seems there's been quite a racket, around New York, selling counterfeit drivers' licenses. Since the state supplies valid ones for a few dollars, it would seem that a racket selling bogus ones for twenty-five dollars didn't have much probability of success. The system is actually quite profitable, however, because the counterfeits are sold to drivers who have been unfairly deprived of their state-issued license. Some judge has taken it away, just because the guy had some tough luck—he happened to run into four or five stupid drivers in a single year, say, and just for that, they take his license away. Or perhaps he had the bad luck to get stopped by a series of mean-tempered cops, and slapped for half a dozen reckless driving complaints.

Being the victim of bad luck like that, and the unfairness of the judge, he naturally resents this treatment, and gets himself another license from more reasonable and understanding people who sell them for twenty-five dollars or so.

So far as that bird is concerned, he's a victim of injustice, unfair rejection, prejudiced and discriminatory action. He was involved in accidents, he feels deeply, because of the stupidity or intransigence of the other drivers.

The fact that it is lucidly clear to you that he is actually, himself, both stupid and intransigent, has no bearing whatever on the matter. You may insist: "He can't really believe it's always the other fellow's fault!" and "know" that it's necessarily just an act on his part.

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You're quite apt to be wrong; the wonderful line from "Li'l Abner" applies. ". . . As any fool can plainly see. I can see." Some things only fools can see—and you have to be a fool to see it that way. But you are decidedly unwise to deny that the fool *does* see it that way!

I know that democratic-idealism-humanitarian philosophy holds that we should not judge our fellow men; it is perhaps sad that that lovely notion won't work. It's acutely necessary to observe the fact that the driver in that car ahead is weaving across the road in an unpredictable manner, and that he is coming toward you at high speed down a two-lane road—and judge him, immediately, as incompetent and an acute menace.

The great problem of the use of judgment is that no one can ever tell, by the use of judgment, whether his judgment is good or bad. The nice, simple example is the matter of what happens to a pilot who tries flying above twenty thousand feet without oxygen. By the time he reaches twenty-five thousand feet, he finds that his thinking has a new, magnificent lucidity—that the confusions and uncertainties that hindered his thinking at lower altitudes have cleared away, that, now, he can solve problems with unerring accuracy and immense rapidity. . . .

Under conditions of anoxemia, the highest conscious functions are the first to stop; the judgment function drops out first of all. Judgment balances opposing alternatives, considers variations and undesired possibilities as well as the desired. When that function drops out, naturally the thought processes are far less uncertain, confused, and complex. The pilot can't, in actuality, solve simple arithmetic problems while in that state, but he feels deeply sure that, with his new and unerring certainty, he has worked out the complete and perfect answers to the deepest problems of philosophy . . .

Opium and morphine produce quite similar effects; there's such a magnificent certainty that *now* the whole secret of the Universe is at last within your grip . . . ! And it always slips away before you can bring it back to normal life . . .

Judgment can't judge itself. Logic can't test itself; that was the great error of the Greek logicians, why Athens in the Periclean Golden Age died of the plague. Logic doesn't build functional sewage systems and aqueducts. The Roman Republic wasn't very good at logic, but they had some highly practical men.

The difficulty is that judgment must be tested—*and not by judgment.* The test must be nonjudicious —not subject to, but master of, judgment. Since judgment is a man's proudest achievement, submitting his judgment to testing *that he cannot understand judiciously* inevitably feels like a violent perversion of justice.

Try pointing out the errors in thinking to a man suffering from anoxemia, and not aware of it. The task is inherently hopeless.

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There's a quite simple fundamental law of testing that comes out of this: A test of any higher critical function which an individual fails, by the fact of that failure, can never be explained to him. It will, therefore, feel to him to be unreal, unfair, a biased, prejudiced, whimsical, dishonest test.

The driver who buys the bogus license cannot be made to see that his driving judgment is incompetent; the practical test—repeated accidents or other misadventures—seems to him unreal, biased, unfair. The judge doesn't recognize that it was bad luck, not bad judgment, that caused the series of disasters. If he possessed a level of judgment capable of appreciating the fact—the existence of that level of judgment would have operated to prevent the occurrences. In other words, if he had what it took to be a good driver, he would have had what was needed to understand why he failed the test . . . except that, then, he wouldn't have failed the test!

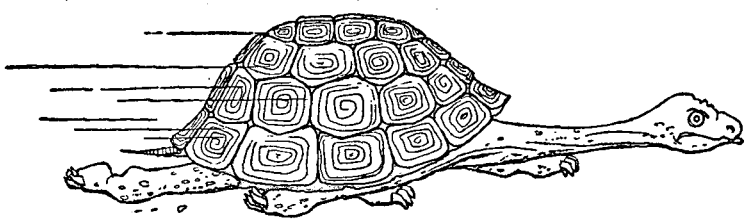
Any valid test of higher critical functions will, automatically, have the characteristic that only those who have the ability to pass the test will perceive precisely what was being tested, and that the test was valid. Only the ones having the required ability will be able to know that the ability tested for is real, and is actually tested for.

Those who fail the test will, inevitably, feel that the test was invalid, there was no such thing as the postulated ability being tested for, and that they have been rejected by a biased clique. You can see that those who pass the test all band together to say it's real, while all those who fail agree there isn't any real test, can't you? That proves the test's a phony, don't it, huh?

If we have an accurate, valid test for color blindness, those who fail the test will do so because they cannot perceive the differences the test presents for discrimination. Because they lack the ability to perceive, you *cannot* show them the test is valid.

Now suppose we institute a true,

(*Continued on page* 177)



Behold the tortoise: He maketh no progress unless he sticketh out his neck

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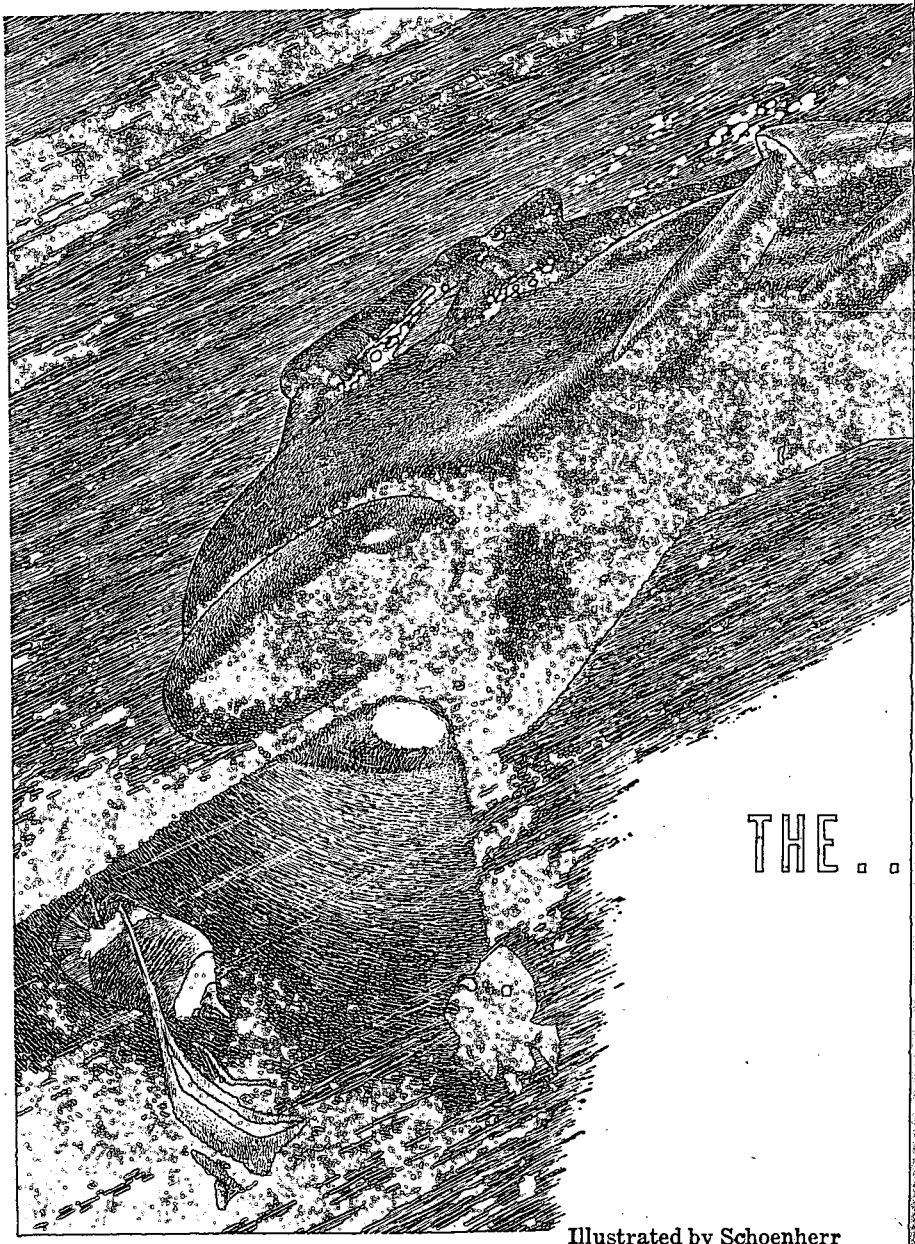

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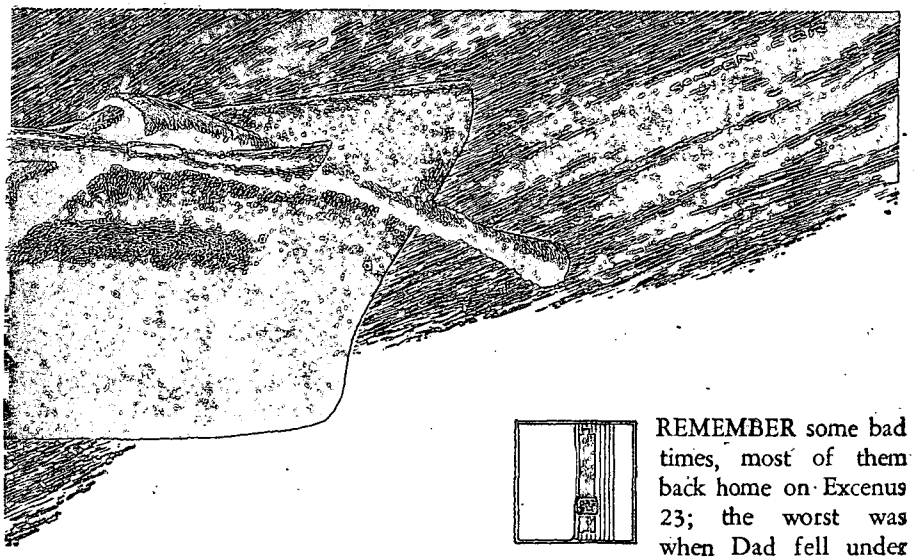

. . . LOST KAFOOZALUM

By PAULINE ASHWELL

One of the beautiful things about a delusion is that no matter how mad someone gets at it . . . he can't do it any harm. Therefore a delusion can be a fine thing for prodding angry belligerents. . . .

I REMEMBER some bad times, most of them back home on Excenus 23; the worst was when Dad fell under the reaping machine but there was also the one when I got lost twenty miles from home with a dud radio, at the age of twelve; and the one when Uncle Charlie caught me practicing emergency turns in a helicar round the main weather-maker; and the one on Figuerra being chased by a cyber-crane; and the time when Dad decided to send me to Earth to do my Education.

This time is bad in a different way, with no sharp edges but kind of a desolation.

Most people I know are feeling bad just now, because at Russett Col-

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lege we finished our Final Examination five days ago and Results are not due for a two weeks.

My friend B Laydon says this is yet another Test anyone still sane at the end being proved tough enough to break a molar on; she says also The worst part is in bed remembering all the things she could have written and did not; The second worst is also in bed picturing how to explain to her parents when they get back to Earth that *someone* has to come bottom and in a group as brilliant as Russett College Cultural Engineering Class this is really no disgrace.

I am not worried that way so much, I cannot remember what I wrote anyway and I can think of one or two people I am pretty sure will come bottomer than me—or B either.

I would prefer to think it is just Finals cause me to feel miserable but it is not.

In Psychology they taught us The mind has the faculty of concealing any motive it is ashamed of, especially from itself; seems unfortunately mine does not have this gadget supplied.

I never wanted to come to Earth, I was sent to Russett against my will and counting the days till I could get back to Home, Father and Ex-census 23, but the sad truth is that now the longed-for moment is nearly on top of me I do not want to go.

Dad's farm was a fine place to grow up, but now I had four years on Earth the thought of going back there makes me feel like a three-weeks' chicken got to get back in its shell.

B and I are on an island in the Pacific. Her parents are on Caratacus researching on local art forms, so she and I came here to be miserable in company and away from the rest.

It took me years on Earth to get used to all this water around, it seemed unnatural and dangerous to have it all lying loose that way, but now I shall miss even the Sea.

The reason we have this long suspense over Finals is that they will not use Reading Machines to mark the papers for fear of cutting down critical judgment; so each paper has to be read word by word by three Examiners, and there are forty-three of us and we wrote six papers each.

What I think is I am sorry for the Examiners, but B says they were the ones who set the papers and it serves them perfectly right.

I express surprise because D. J. M'Clare our Professor is one of them, but B says He is one of the greatest men in the galaxy, of course, but she gave up thinking him perfect *years* ago.

One of the main attractions on this Island is swimming under water, especially by moonlight. Dad sent me a fish-boat as a birthday present two years back, but I never used it yet on account of my above-mentioned attitude to water. Now I got this feeling of Carpe Diem, make the most of Earth while I am on it because probably I shall not pass this way again.

The fourth day on the Island it

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is full moon at ten o'clock, so I pluck up courage to wriggle into the boat and go out under the Sea. B says Fish parading in and out of reefs just remind her of Cultural Engineering—crowd behavior—so she prefers to turn in early and find out what nightmare her subconscious will throw up *this* time.

The reefs by moonlight are everything they are supposed to be, why did I not do this often when I had the chance? I stay till my oxygen is nearly gone, then come out and sadly press tthe button that collapses the boat into a thirty-pound package of plastic hoops and oxygen cans. I sling it on my back and head for the chalet B and I hired among the coconut trees.

I am crossing an open space maybe fifty yards from it when a Thing drops on me out of the air.

I do not see the Thing because part of it covers my face, the rest is grabbed round my arms and my waist and my hips and whatever, I cannot see and I cannot scream and I cannot find anything to kick. The Thing is strong and rubbery and many-armed and warmish, and less than a second after I first feel it I am being hauled up into the air.

I do not care for this at all.

I am at least fifty feet up before it occurs to me to bite the hand that gags me and then I discover it is plastic, not alive at all. Then I feel self and encumberance scraping through some kind of aperture; there is a sharp click as of a door closing and the Thing goes limp all round me.

I spit out the bit I am biting and it drops away so that I can see.

Well!

I am in a kind of a cup-shaped space maybe ten feet across but not higher than I am; there is a trap door in the ceiling; the Thing is lying all around me in a mess of plastic arms, with an extensible stalk connecting it to the wall. I kick free and it turns over exposing the label FRAGILE CARGO right across the back.

The next thing I notice is two holdalls, B's and mine, clamped against the wall, and the next after that is the opening of a trap door in the ceiling and B's head silhouetted in it remarking Oh there you are Liz.

I confirm this statement and ask for explanations.

B says She doesn't understand all of it but it is all right.

It is not all right I reply, if she has joined some Society such as for the Realization of Fictitious Improbabilities that is her privilege but no reason to involve me.

B says Why do I not stop talking and come up and see for myself?

There is a slight hitch when I jam in the trap door, then B helps me get the boat off my back and I drop it on the Fragile Cargo and emerge into the cabin of a Hopper, drop-shaped, cargo-carrying; I have been in its hold till now.

There are one or two peculiar points about it, or maybe one or two

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hundred, such as the rate at which we are ascending which seems to be bringing us right into the Stratosphere; but the main thing I notice is the pilot. He has his back to us but is recognizably Ram Gopal who graduated in Cultural Engineering last year, Rumor says next to top of his class.

I ask him what kind of a melodramatic shenanigan is this?

B says We had to leave quietly in a hurry without attracting attention so she booked us out at the Hotel *hours* ago and she and Ram have been hanging around waiting for me ever since.

I point out that the scope-trace of an Unidentified Flying Object will occasion a lot more remark than a normal departure even at midnight.

At this Ram smiles in an inscrutable Oriental manner and B gets nearly as cross as I do, seems she has mentioned this point before.

We have not gone into it properly when the cabin suddenly shifts through a right angle. B and I go sliding down the vertical floor and end sitting on a window There is a jolt and a shudder and Ram mutters things in Hindi and then suddenly Up is nowhere at all.

B and I scramble off the window and grab fixtures so as to stay put. The stars have gone and we can see nothing except the dim glow over the instruments; then suddenly lights go on outside.

We look out into the hold of a ship.

Our ten-foot teardrop is sitting next to another one, like two eggs in a rack. On the other side is a bulkhead; behind, the curve of the hull; and directly ahead an empty space, then another bulkhead and an open door, through which after a few seconds a head pokes cautiously.

The head is then followed by a body which kicks off against the wall and sails slowly towards us. Ram presses a stud and a door slides open in the hopper; but the new arrival stops himself with a hand on either side of the frame, his legs trailing any old how behind him. It is Peter Yeng Sen who graduated the year I did my Field Work.

He says, Gopal, dear fellow, there was no need for the knocking, we heard the bell all right.

Ram grumbles something about the guide beam being miss-set, and slides out of his chair. Peter announces that we have only just made it as the deadline is in seven minutes time; he waves B and me out of the hopper, through the door and into a corridor where a certain irregular vibration is coming from the walls.

Ram asks what is that tapping? And Peter sighs and says The present generation of students has no discipline at all.

At this B brakes with one hand against the wall and cocks her head to listen; next moment she laughs and starts banging with her fist on the wall.

Peter exclaims in Mandarin and tows her away by one wrist like a reluctant kite. The rapping starts again on the far side of the wall and

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I suddenly recognize a primitive signaling system called Regret or something, I guess because it was used by people in situations they did not like such as Sinking ships or solitary confinement; it is done by tapping water pipes and such.

Someone found it in a book and the more childish element in College learned it up for signaling during compulsory lectures. Interest waning abruptly when the lecturers started to learn it, too.

I never paid much attention not expecting to be in Solitary confinement much; this just shows you; next moment Ram opens a door and pushes me through it, the door clicks behind me and Solitary confinement is what I am in.

I remember this code is really called Remorse which is what I feel for not learning when I had the chance.

However I do not have long for it, a speaker in the wall requests everyone to lie down as acceleration is about to begin. I strap down on the couch which fills half the compartment, countdown begins and at zero the floor is suddenly *down* once more.

I wait till my stomach settles, then rise to explore.

I am in an oblong room about eight by twelve, it looks as though it had been hastily partitioned off from a larger space. The walls are prefab plastic sheet, the rest is standard fittings slung in and bolted down with the fastenings showing.

How many of my classmates are on this ship? *Remorse* again as tapping starts on either side of me.

Discarding such Hypotheses as that Ram and Peter are going to hold us to ransom—which might work for me, since my Dad somehow got to be a millionaire, but not for B because her parents think money is vulgar—or that we are being carried off to found an ideal Colony somewhere—any first-year student can tell you why that won't work—only one idea seems plausible.

This is that Finals were not final and we are in for a Test of some sort.

After ten minutes I get some evidence; a Reading Machine is trundled in, the door immediately slamming shut so I do not see who trundles it.

I prowl round it looking for tricks but it seems standard; I take a seat in it, put on the headset and turn the switch.

Hypothesis confirmed, I suppose.

There is a reel in place and it contains background information on a problem in Cultural Engineering all set out the way we are taught to do it in Class. The Problem concerns developments on a planet got settled by two groups during the Exodus and been isolated ever since.

Well while a Reading Machine is running there is no time to think, it crams in data at full speed and evaluation has to wait. However my subconscious goes into action and when the reel stops it produces a Suspicion full grown.

The thing is too tidy.

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When we were First Year we dreamed up situations like this and argued like mad over them, but they were a lot too neat for real life and too dramatic as well.

However one thing M'Clare said to us, and every other lecturer too, just before the Finals, was Do not spend time trying to figure what the examiner was after but answer the question as set; I am more than half-way decided this is some mysterious Oriental idea of a joke but I get busy thinking in case it is not.

The Problem goes like this:

The planet is called Incognita in the reel and it is right on the edge of the known volume of space, it got settled by two groups somewhere between three and three and a half centuries ago. The rest of the human race never heard of it till maybe three years back.

(Well it happens that way, inhabited planets are still turning up eight or ten a century, on account of during the Exodus some folk were willing to travel a year or more so as to get away from the rest).

The ship that spotted the planet as inhabited did not land, but reported to Central Government, Earth, who shipped observers out to take a look.

(There was a rumor circulating at Russett that the Terry Government might employ some of us on that kind of job, but it never got official. I do not know whether to believe this bit or not.)

It is stated the observers landed secretly and mingled with the natives unobserved.

(This is not physically impossible but sounds too like a Field Trip to be true.)

The observers are not named but stated to be graduates of the Cultural Engineering Class.

They put in a few months' work and sent home unanimous Crash Priority reports the situation is *bad,* getting worse and the prognosis is War.

Brother.

I know people had wars, I know one reason we do not have them now is just that with so many planets and cheap transportation, pressure has other outlets; these people scrapped their ships for factories and never built more.

But.

There are only about ten million of them and surely to goodness a whole planet gives room enough to keep out of each other's hair?

Well this is not Reasoning but a Reaction, I go back to the data for another look.

The root trouble is stated to be that two groups landed on the planet without knowing the others were there, when they met thirty years later they got a disagreeable shock.

I cannot see there was any basic difference between them, they were very similar, especially in that neither lot wanted anything to do with people they had not picked themselves.

So they divided the planet along a Great Circle which left two of the

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main land-masses in one hemisphere and two in another.

They agree each to keep to its own section and leave the other alone.

Twenty years later, trading like mad; each has certain minerals the other lacks; each has certain agricultural products the other finds it difficult to grow.

You think this leads to Co-operation Friendship and ultimate Federation?

I will not go into the incidents that make each side feel it is being gypped, it is enough that from time to time each has a scarcity or hold-up on deliveries that upsets the other's economy; and they start experimenting to become self-sufficient: and the exporter's economy is upset in turn. And each thinks the other did it on purpose.

This sort of situation reacts internally leading to Politics.

There are troubles about a medium-sized island on the dividing line, and the profits from interhemispherical transport, and the laws of interhemispherical trade.

It takes maybe two hundred years, but finally each has expanded the Police into an army with a whole spectrum of weapons not to be used on any account except for Defense.

This situation lasts seventy years getting worse all the time, now Rumors have started on each side that the other is developing an Ultimate Weapon, and the political parties not in power are agitating to move first before the thing is complete.

The observers report War not maybe this year or the next but within ten, and if neither side was looking for an Ultimate Weapon to begin with they certainly are now.

Taking all this at face value there seems an obvious solution.

I am thinking this over in an academic sort of way when an itchy trickle of sweat starts down my vertebrae.

Who is going to apply this solution? Because if this is anything but another Test, or the output of a diseased sense of humor, I would be sorry for somebody.

I dial black coffee on the wall servitor and wish B were here so we could prove to each other the thing is just an exercise; I do not do so well at spotting proofs on my own.

Most of our class exercises have concerned something that happened, once.

After about ninety minutes the speaker requests me to write not more than one thousand words on any scheme to improve the situation and the equipment required for it.

I spent ten minutes verbalizing the basic idea and an hour or so on "equipment"; the longer I go on the more unlikely it all seems. In the end I have maybe two hundred words which acting on instructions I post through a slit in the door.

Five minutes later I realize I have forgotten the Time Factor.

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If the original ship took a year to reach Incognita, it will take at least four months now; therefore it is more than four months since that report was written and will be more than a year before anyone arrives and War may have started already.

I sit back and by transition of ideas start to wonder where this ship is heading? We are still at one gee and even on Mass-Time you cannot juggle apparent acceleration and spatial transition outside certain limits; we are not just orbiting but must be well outside the Solar System by now.

The speaker announces Everyone will now get some rest; I smell sleep-gas for one moment and have just time to lie down.

I guess I was tired, at that.

When I wake I feel more cheerful than I have for weeks; analysis indicates I am glad something is *happening* even if it is another Exam.

I dial breakfast but am too restless to eat; I wonder how long this goes on or whether I am supposed to show Initiative and break out; I am examining things with this in mind when the speaker comes to life again.

It says, "Ladies and gentlemen. You have not been told whether the problem that you studied yesterday concerned a real situation or an imaginary one. You have all outlined measures which you think would improve the situation described. Please consider, seriously, whether you would be prepared to take part yourself in the application of your plan."

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Brother.

There is no way to tell whether those who say No will be counted cowardly or those who say Yes rash idiots or what, the owner of that voice has his inflections too well trained to give anything away except intentionally.

D. J. M'Clare.

Not in person but a recording, anyway M'Clare is on Earth surrounded by exam papers.

I sit back and try to think, honestly, if that crack-brained notion I wrote out last night were going to be tried in dead earnest, would I take a hand in it?

The trouble is, hearing M'Clare's voice has convinced me it is a Test, I don't know whether it is testing my courage or my prudence in fact I might as well toss for it.

Heads I am crazy, Tails a defaulter; Tails is what it is.

I seize my styler and write the decision down.

There is the slit in the door.

I twiddle the note and think Well nobody asked for it yet.

Suppose it is real, after all?

I remember the itchy, sweaty feeling I got yesterday and try to picture really embarking on a thing like this, but I cannot work up any lather today.

I begin to picture M'Clare reading my decision not to back up my own idea.

I pick up the coin and juggle it around.

The speaker remarks When I am quite ready will I please make a note of my decision and post it through the door.

I go on flipping the coin up and presently it drops on the floor, it is Heads this time.

Tossing coins is a pretty feeble way to decide.

I drop the note on the floor and take another sheet and write "YES. Lysistrata Lee."

Using that name seems to make it more legal.

I slip the paper in the slit and poke till it falls through on the other side of the door.

I am suddenly immensely hungry and dial breakfast all over again.

Just as I finish M'Clare's voice starts once more.

"It's always the minor matters that cause the most difficulty. The timing of this announcement has cost me as much thought as any aspect of the arrangements. The trouble is that however honest you are—and your honesty has been tested repeatedly—and however strong your imagination —about half of your training has been devoted to developing it—you can't possibly be sure, answering a hypothetical question, that you are giving the answer you would choose if you knew it was asked in dead earnest.

"Those of you who answered the question in the negative are out of this. They have been told that it was a test, of an experimental nature, and have been asked to keep the whole thing a secret. They will be returning to Earth in a few hours' time. I ask

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the rest of you to think it over once again. Your decision is still private. Only the two people who gathered you together know which members of the class are in this ship. The list of possible helpers was compiled by a computer. I haven't seen it myself.

"You have a further half hour in which to make up your minds finally. Please remember that if you have any private reservations on the matter, or if you are secretly afraid, you may endanger us all. You all know enough psychology to realize this.

"If you still decide in favor of the project, write your name on a slip of paper and post it as before. If you are not absolutely certain about it, do nothing. Please think it over for half an hour."

Me, I had enough thinking. I write my name—just L. Lee—and post it straight away.

However I cannot stop thinking altogether. I guess I think very hard, in fact. My Subconscious insists afterwards that it did register the plop as something came through the slit, but my Conscious failed to notice it at all.

Hours later—my watch says twenty-five minutes but I guess the Mass-Time has affected it—anyway I had three times too much solitary confinement—when will they let me *out* of here?—there is a knock at the door and a second later it slides apart.

I am expecting Ram or Peter so it takes me an appreciable fraction of a moment to realize I am seeing D. J. M'Clare.

Then I remember he is back on Earth buried in Exam papers and conclude I am having a hallucination

This figment of my imagination says politely, "Do you mind if I sit down?"

He collapses on the couch as though thoroughly glad of it.

It is a strange thing, every time I see M'Clare I am startled all over again at how good-looking he is; seems I forget it between times which is maybe why I never fell for him as most female students do.

However what strikes me this time is that he looks tired, three-days-sleepless tired with worries on top.

I guess he is real, at that.

He says, "Don't look so accusing, Lizzie, I only just got on this ship myself."

This does not make sense; you cannot just arrive on a ship twenty-four hours after it goes on Mass-Time; or can you?

M'Clare leans back and closes his eyes and inquires whether I am one of the Morse enthusiasts?

So that is the name; I say when we get back I will learn it first thing.

"Well," says he, "I did my best to arrange privacy for all of you; with so many ingenious idiots on board I'm not really surprised that they managed to circumvent me. I had to cheat and check that you really were on the list; and I knew that whoever backed out you'd still be on board."

So I should hope he might: Horrors there is my first answer screwed

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up on the floor and Writing side topmost.

However he has not noticed it, he goes on "Anyway you of all people won't be thought to have dropped out because you were afraid."

I have just managed to hook my heel over the note and get it out of sight, M'Clare has paused for an answer and I have to dredge my Subthreshold memories for—

WHAT?

M'Clare opens his eyes and says like I am enacting Last Straw, "Have some sense, Lizzie." Then in a different tone, "Ram says he gave you the letter half an hour ago."

What letter?

My brain suddenly registers a small pale patch been occupying a corner of my retina for the last half hour; it turns out to be a letter postmarked Excenus 23.

I disembowl it with one jerk. It is from my Dad and runs like this: My dear Liz,

Thank you for your last letter, glad you are keeping fit and so am I.

I just got a letter from your College saying you will get a degree conferred on you on September 12th and parents if on Earth will be welcome.

Well Liz this I got to see and Charlie says the same, but the letter says too Terran Authority will not give a permit to visit Earth just for this, so I wangled on to a Delegation is coming to discuss trade with the Department of Commerce. Charlie and I will be arriving on Earth on August 24th.

Liz it is good to think I shall be seeing you again after four years. There are some things about your future I meant to write to Professor M'Clare about, but now I shall be able to talk it over direct. Please give him my regards.

Be seeing you Lizzie girl, your affectionate Dad

J. X. Lee.

Dear old Dad, after all these years farming with a weather-maker on a drydust planet I want to see his face the first time he sees real rain.

Hell's fires and shades of darkness, I shan't be there!

M'Clare says, "Your father wrote to me saying that he will be arriving on Earth on 24th August. I take it your letter says the same. I came on a dispatch boat; you can go back on it."

Now what is he talking about? Then I get the drift.

I say, "Look. So Dad will be on Earth before we get back. What difference does that make?"

"You can't let him arrive and find you missing."

Well I admit to a qualm at the thought of Dad let loose on Earth without me, but after all Uncle Charlie is a born Terrie and can keep him in line; Hell he is old enough to look after himself anyway.

"You met my Dad," I point out. "You think J. X. Lee would want any daughter of his backing out on a job so as to hold his hand? I can send him a letter saying I am off on a job or a Test or whatever I please and hold everything till I get back; what

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are you doing about people's families on Earth already?"

M'Clare says we were all selected as having families *not* on Earth at present, and I must go back.

I say like Hell I will.

He says he is my official guardian and responsible for me.

I say he is just as responsible for everyone else on this ship.

I spent years and years trying to think up a remark would really get home to M'Clare; well I have done it now.

I say, "Look. You are tired and worried and maybe not thinking so well just now.

"I know this is a very risky job, don't think I missed that at all. I tried hard to imagine it like you said over the speaker. I cannot quite imagine dying but I know how Dad will feel if I do.

"I did my level best to scare myself sick, then I decided it is just plain worth the risk anyway.

"To work out a thing like this you have to have a kind of arithmetic, you add in everybody's feelings with the other factors, then if you get a plus answer you forget everything else and go right ahead.

"I am not going to think about it any more, because I added up the sum and got the answer and upsetting my nerves won't help. I guess you worked out the sum, too. You decided four million people were worth risking twenty, even if they do have parents. Even if they are your students. So they are, too, and you gave us all a chance to say No.

"Well nothing has altered that, only now the values look different to you because you are tired and worried and probably missed breakfast, too."

Brother some speech, I wonder what got into me? M'Clare is wondering, too, or maybe gone to sleep sitting, it is some time before he answers me.

"Miss Lee, you are, deplorably right on one thing at least. I don't know whether I was fit to make such a decision when I made it, but I'm not fit now. As far as you personally are concerned . . ." He trails off looking tireder than ever, then picks up again suddenly. "You are again quite right, I am every bit as responsible for the other people on board as I am for you."

He climbs slowly to his feet and walks out without another word.

The door is left open and I take this as an invitation to freedom and shoot through in case it was a mistake.

No because Ram is opening doors all along the corridor and ten of Russett's brightest come pouring out like mercury finding its own level and coalesce in the middle of the floor.

The effect of release is such that after four minutes Peter Yeng Sen's head appears at the top of a stairway and he says the row is lifting the desk plates, will we for Time's sake go along to the Conference Room which is soundproof.

The Conference Room is on the next deck and like our cabins shows

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signs of hasty construction; the soundproofing is there but the acoustics are kind of muffled and the generator is not boxed in but has cables trailing all over, and the fastenings have a strong but temporary look.

Otherwise there is a big table and a lot of chairs and a small projection box in front of each with a note-taker beside.

It is maybe this very functional set-up or maybe the dead flatness of our voices in the damped room, but we do not have so much to talk about any more. We automatically take places at the table, all at one end, leaving seven vacant chairs near the door.

Looking round, I wonder what principle we were selected on.

Of my special friends Eru Te Whangoa and Kirsty Lammergaw are present but Lily Chen and Likofo Komom'baratse and Jean LeBrun are not; we have Cray Patterson who is one of my special enemies but not Blazer Weigh or the Astral Cad; the rest are P. Zapotec, Nick Howard, Aro Mestah, Dillie Dixie, Pavel Christianovitch, Lennie DiMaggio and Shootright Crow.

Eru is at the end of the table, opposite the door, and maybe feels this position puts it up to him to start the discussion; he opens by remarking "So nobody took the opportunity to withdraw."

Cray Patterson lifts his eyebrows ceilingwards and drawls out that the decision was supposed to be a private one.

B says Maybe but it did not work out that way, everyone who learned Morse knows who was on the ship, anyway they are all still here so what does it matter? And M'Clare would not have picked people who were going to funk it, after all.

My chair gets a kick on the ankle which I suppose was meant for B; Eru is six foot five but even his legs do not quite reach; he is the only one of us facing the door.

M'Clare has somehow shed his weariness; he looks stern but fresh as a daisy. There are four with him; Ram and Peter looking serious, one stranger in Evercleans looking determined to enjoy the party and another in uniform looking as though nothing would make him.

M'Clare introduces the strangers as Colonel Delano-Smith and Mr. Yardo. They all sit down at the other end of the table; then he frowns at us and begins like this:

"Miss Laydon is mistaken. You were not selected on any such grounds as she suggests. I may say that I was astonished at the readiness with which you all engaged yourselves to take part in such a desperate gamble; and, seeing that for the last four years I have been trying to persuade you that it is worth while, before making a decision of any importance, to spend a certain amount of thought on it, I was discouraged as well."

Oh.

"The criterion upon which you were selected was a very simple one. As I told you, you were picked not by me but by a computer; the one in

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the College Office which registers such information as your home addresses and present whereabouts. You are simply that section of the class which could be picked up without attracting attention, because you all happened to be on holiday by yourselves or with other members of the class; and because your nearest relatives are not on Earth at present."

Oh, well.

All of us can see M'Clare is doing a job of deflation on us for reasons of his own, but it works for all that.

He now seems to feel the job is complete and relaxes a bit.

"I was interested to see that you all, without exception, hit on variations of the same idea. It is of course the obvious way to deal with the problem." He smiles at us suddenly and I get mad at myself because I know he is following the rules for inducing a desired state of mind, but I am responding as meant. "I'll read you the most succinct expression of it; you may be able to guess the author."

Business with bits of paper.

"Here it is. I quote: 'Drag in some outsider looks like he is going for both sides; they will gang up on him.'

Yells of laughter and shouts of "Lizzie Lee!" even the two strangers produce sympathetic grins; I do not find it so funny as all that myself.

"Ideas as to the form the 'outsider' should take were more varied. This is a matter I propose to leave you to work out together, with the assistance of Colonel Delano-Smith and Mr. Yardo. Te Whangoa, you take the chair."

Exit M'Clare.

This leaves the two halves of the table eying one another. Ram and Peter have been through this kind of session in their time; now they are leaning back preparing to watch us work. It is plain we are supposed to impress the abilities of Russett near-graduates on the two strangers, and for some moments we are all occupied taking them in. Colonel Delano-Smith is a small, neat guy with a face that has all the muscular machinery for producing an expression; he just doesn't care to use it. Mr. Yardo is taller than any of us except Eru and flesh is spread very thin on his bones, including his face which splits now and then in a grin like an affable skeleton. Where the colonel fits is guessable enough, Mr. Yardo is presumably Expert at something but no data on *what*.

Eru rests his hands on the table and says we had better start; will somebody kindly outline an idea for making the Incognitans "gang up"? The simpler the better and it does not matter whether it is workable or not; pulling it to pieces will give us a start.

We all wait to see who will rush in; then I catch Eru's eye and see I am elected Clown again, I say "Send them a letter postmarked Outer Space signed BEM saying we lost our own planet in a nova and will take over theirs two weeks from Tuesday."

Mr. Yardo utters a sharp "Ha!

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Ha!" but it is not seconded: the colonel having been expressionless all along becomes more so; Eru says, "Thank you, Lizzie." He looks across at Cray who is opposite me; Cray says there are many points on which he might comment; to take only one, two weeks from Tuesday leaves little time for 'ganging up' and what happens when the BEMs fail to come?"

We are suddenly back in the atmosphere of a seminar; Eru's glance moves to P. Zapotec sitting next to Cray, and he says, "These BEMs who lost their home planet in a nova, how many ships have they? Without a base they cannot be very dangerous unless their fleet is very large."

It goes round the table.

Pavel: "How would BEMs learn to write?"

Nick: "How are they supposed to know that Incognita is inhabited? How do they address the letter?"

The Crow: "Huh. Why write letters? Invaders just invade."

Kirsty: "We don't want to inflame these people against alien races. We might *find* one some day. It seems to me this idea might have all sorts of undesirable by-products. Suppose each side regards it as a ruse on the part of the other. We might touch off a war instead of preventing it. Suppose they turn over to preparations for repelling the invaders, to an extent that cripples their economy? Suppose a panic starts?"

Dilly: "Say, Mr. Chairman, is there any of this idea left at all? How about an interim summary?"

Eru coughs to get a moment for thought, then says:

"In brief, the problem is to provide a menace against which the two groups will be forced to unite. It must have certain characteristics.

"It must be sufficiently far off in time for the threat to last several years, long enough to force them into a real combination.

"It must obviously be a plausible danger and they must get to know of it in a plausible manner. Invasion from outside is the only threat so far suggested.

"It must be a limited threat. That is, it must appear to come from one well-defined group. The rest of the Universe should appear benevolent or neutral."

He just stops, rather as though there is something else to come; while the rest of us are waiting B sticks her oar in to the following effect.

"Yes but look, suppose this goes wrong; it's all very well to make plans but suppose we do get some of Kirsty's side-effects just the same, well what I mean is suppose it makes the mess worse instead of better we want some way we can sort of switch it off again.

"Look this is just an illustration, but suppose the Menace was pirates, if it went wrong we could have an Earth ship making official contact and they could just happen to say By the way have you seen anything of some pirates, Earth fleet wiped them up in this sector about six months ago.

"That would mean the whole crew

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conniving, so it won't do, but you see what I mean."

There is a bit of silence, then Aro says, "I think we should start fresh. We have had criticisms of Lizzie's suggestion, which was not perhaps wholly serious, and as Dilly says there is little of it left, except the idea of a threat of invasion. The idea of an alien intelligent race has objections and would be very difficult to fake. The invaders must be men from another planet. Another unknown one. But how do the people of Incognita come to know that they exist?"

More silence, then I hear my own voice speaking although it was my intention to keep quiet for once: it sounds kind of creaky and it says: "A ship. A crashed ship from Outside."

Whereupon another voice says, "Really! Am I expected to swallow this?"

We had just about forgotten the colonel, not to mention Mr. Yardo who contributes another "Ha! Ha!" so this reminder comes as a slight shock, nor do we see what he is talking about but this he proceeds to explain.

"I don't know why M'Clare thought it necessary to stage this discussion. I am already acquainted with his plan and have had orders to cooperate. I have expressed my opinion on using undergraduates on a job like this and have been overruled. If he, or you, imagine that priming you to bring out his ideas like this is going to reconcile me to the whole business you are mistaken. He might have chosen a more suitable mouthpiece than that child with the curly hair—"

Here everybody wishes to reply at once; the resulting jam produces a moment of silence and I get in first.

"As for curly hair I am rising twenty-four and I was only saying what we all thought, if we have the same ideas as M'Clare that is because he taught us for four years. How else would you set about it anyway?"

My fellow students pick up their stylers and tap solemnly three times on the table; this is the Russett equivalent of "Hear! Hear!" and the colonel is surprised.

Eru says coldly, "This discussion has not been rehearsed. As Lizzie . . . as Miss Lee says, we have been working and thinking together for four years and have been taught by the same people."

"Very well," says Delano-Smith testily. "Tell me this, please: Do you regard this idea as practicable?"

Cray tilts his chair back and remarks to the ceiling, "This is rather a farce. I suppose we had to go through our paces for the colonel's benefit—and Mr. Yardo's of course —but can't we be briefed properly now?"

"What do you mean by that?" snaps the colonel.

"It's been obvious right along," says Cray, balancing his styler on one forefinger, "so obvious none of us has bothered to mention it, that accepting the normal limitations of Mass-Time, the idea of interfering in Incognita was doomed before it be-

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gan. No conventional ship would have much hope of arriving before war broke out; and if it did arrive it couldn't do anything effective. Therefore I assume that this is *not* a conventional ship. I might accept that the Government has sent us out in a futile attempt to do the impossible, but I wouldn't believe that of M'Clare."

Cray is the only Terry I know acts like an Outsider's idea of one; many find this difficult to take and the colonel is plainly one of them. Eru intervenes quickly.

"I imagine we all realized that. Anyway this ship is obviously *not* a conventional model. If you accept the usual Mass-Time relationship between the rate of transition and the fifth power of the apparent acceleration, we must have reached about four times the maximum already."

"Ram!" says B suddenly, "What did you do to stop the Hotel scope registering the little ship you picked up me and Lizzie in?"

Everybody cuts in with something they have noticed about the capabilities of this ship or the hoppers, and Lenny starts hammering on the table and chanting! "Brief!Brief!Brief!" and others are just starting to join in when Eru bangs on the table and glares us all down.

Having got silence, he says very quietly, "Colonel Delano-Smith, I doubt whether this discussion can usefully proceed without a good deal more information; will you take over?"

The colonel looks round at all the eager earnest interested maps hastily put on for his benefit and decides to take the plunge.

"Very well. I suppose it is . . . very well. The decision to use students from Russett was made at a very high level, and I suppose—" Instead of saying "Very well" again he shrugs his shoulders and gets down to it.

"The report from the planet we decided to call 'Incognita' was received thirty-one days ago. The Department of Spatial Affairs has certain resources which are not generally known. This ship is one of them. She works on a modified version of Mass-Time which enables her to use about a thousand channels instead of the normal limit of two hundred; for good and sufficient reasons this has not been generally released."

Pause while we are silently dared to doubt the Virtue and sufficiency of these reasons which personally I do not.

"To travel to Incognita direct would take about fifteen days by the shortest route. We shall take eighteen days as we shall have to make a detour."

But presumably we shall take only fifteen days back. Hurrah we can spend a week round the planet and still be back in time for Commemoration. We shall skip maybe a million awkward questions and I shall not disappoint Dad.

It is plain the colonel is not filled with joy; far from it, he did not enjoy revealing a Departmental secret

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however obvious, but he likes the next item even less.

"We shall detour to an uninhabited system twelve days' transit time from here and make contact with another ship, the *Gilgamesh*."

At which Lennie DiMaggio who has been silent till now brings his fist down on the table and exclaims, "You *can't!*"

Lennie is much upset for some reason; Delano-Smith gives him a peculiar look and says what does he know about it? and Lennie starts to stutter.

Cray remarks that Lennie's childhood hobby appears to have been spaceships and he suffers from arrested development.

B says it is well known Lennie is mad about the Space Force and why not? It seems to have uses Go on and tell us Lennie.

Lennie says "*G-Gilgamesh* was lost three hundred years ago!"

"The flaw in that statement," says Cray after a pause, "is that this may be another ship of the same name."

"No," says the colonel. "Explorer Class cruiser. They went out of service two hundred eighty years back."

The Space Force, I remember, does not re-use names of lost ships: some says Very Proper Feeling some say Superstitious Rot.

B says, "When was she found again?"

Lennie says it was j-just thirty-seven revolutions of his native planet which means f-f-fifty-three Terrestrial

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years ago, she was found by an Interplanetary scout called *Crusoe*.

Judging by the colonel's expression this data is Classified; he does not know that Lennie's family come from one of the oldest settled planets and are space-goers to a man, woman and juvenile; they pick up ship gossip the way others hear about the relations of people next door.

Lennie goes on to say that the Explorer Class were the first official exploration ships sent out from Earth when the Terries decided to find out what happened to the colonies formed during the Exodus. *Gilgamesh* was the first to re-make contact with Garuda, Legba, Lister, Cor-bis and Antelope; she vanished on her third voyage.

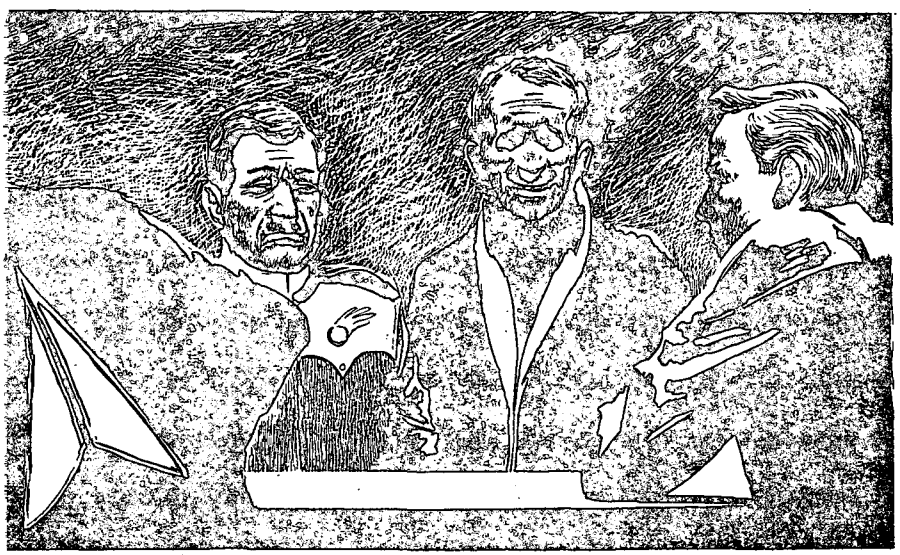
"Where was she found?" asks Eru.

"Near the p-p-pole of an uninhabited planet—maybe I shouldn't say where because that may be secret, but the rest's History if you know where to look."

Maybe the colonel approves this discretion; anyway his face thaws very slightly unless I am Imagining it.

"*Gilgamesh* crashed," he says. "Near as we can make out from the log, she visited Seleucis system. That's a swarmer sun. Fifty-seven planets, three settled; and any number of fragments. The navigator calculated that after a few more revolutions one of the fragments was going to crash on an inhabited planet. Might have done a lot of damage. They decided to tow it out of the way.

"Grappling-beams hadn't been in-



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vented. They thought they could use Mass-Time on it a kind of reverse thrust—throw it off course.

"Mass-Time wasn't so well understood then. Bit off more than they could chew. Set up a topological relation that drained all the free energy out of the system. Drive, heating system—everything.

"She had emergency circuits. When the engines came on again they took over—landed the ship, more or less, on the nearest planet. Too late, of course. Heating system never came on—there was a safety switch that had to be thrown by hand. She was embedded in ice when she was found. Hull breached atone point—no other serious damage."

"And the . . . the crew?"

Dillie ought to know better than that.

"Lost with all hands," says the colonel.

"How about weapons?"

We are all startled. Cray is looking whitish like the rest of us but maintains his normal manner, i.e. offensive affection while pointing out that *Gilgamesh* can hardly be taken for a Menace unless she has some means of aggression about her.

Lennie says The Explorer Class were all armed—

Fine, says Cray, presumably the weapons will be thoroughly obsolete and recognizable only to a Historian—

Lennie says that the construction of no weapon developed by the Space Department has ever been released; making it plain that anyone but a Nitwit knows that already.

Eru and Kirsty have been busy for some time writing notes to each other and she now gives a small sharp cough and having collected our attention utters the following Address.

"There is a point we seem to have missed. If I may recapitulate, the idea is to take this ship *Gilgamesh* to Incognita and make it appear as though she had crashed there while attempting to land. I understand that the ship has been buried in the polar cap; though she must have been melted out if the people on *Crusoe* examined the engines. Of course the cold—All the same there may have been . . . well . . . changes. Or when . . . when we thaw the ship out again—"

I find I am swallowing good and hard, and several of the others look sick, especially Lennie. Lennie has his eyes fixed on the colonel; it is not prescience but a slight sideways movement of the colonel's eye causes him to blurt out, "What is *he* doing here?"

Meaning Mr. Yardo who seems to have been asleep for some time, with his eyes open and grinning like the spikes on a dog collar. The colonel gives him another sideways look and says. "Mr. Yardo is an expert on the rehabilitation of space-packed materials."

This is stuff transported in unpowered hulls towed by grappling-beams; the hulls are open to space hence no need for refrigeration, and the contents are transferred to specially equipped orbital stations before being taken down to the planet. But—

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Mr. Yardo comes to life at the sound of his name and his grin widens alarmingly.

"Especially meat," he says.

It is maybe two hours afterwards, Eru having adjourned the meeting abruptly so that we can . . . er . . . take in the implications of the new data. Lennie has gone off somewhere by himself; Kirsty has gone after him with a view to Mothering him; Eru, I suspect, is looking for Kirsty; Pavel and Aro and Dillie and the Crow are in a cabin arguing in whispers; Nick and P. Zapotec are exploring one of the Hoppers, cargo-carrying, drop-shaped, and I only hope they don't hop through the hull in it.

B and I having done a tour of the ship and ascertained all this have withdrawn to the Conference Room because we are tired of our cabins and this seems to be the only other place to sit.

B breaks a long silence with the remark that However often you see it M'Clare's technique is something to watch, like choosing my statement to open with, it broke the ice beatifully.

I say, "Shall I tell you something?"

B says Yes if it's interesting.

"My statement," I inform her, "ran something like this: 'The best hope of inducing a suspension of the aggressive attitude of both parties, long enough to offer hope of ultimate reconciliation, lies in the intrusion of a new factor in the shape of an outside force seen to be impartially hostile to both."

B says: "Gosh. Come to think of it Liz you have not written like that in years, you have gone all pompous like everyone else; well that makes it even *more* clever of M'Clare."

Enter Cray Patterson and drapes himself sideways on a chair, announcing that his own thoughts begin to weary him.

I say this does not surprise me, at all.

"Lizzie my love," says he, "you are twice blessed being not only witty yourself but a cause of wit in others; was that bit of Primitive Lee with which M'Clare regaled us really not from the hand of the mistress, or was it a mere pastiche?"

I say Whoever wrote that it was not me anyway.

"It seemed to me pale and lukewarm compared with the real thing," says Cray languidly, "which brings me to a point that, to quote dear Kirsty, seems to have been missed."

I say, "Yep. Like what language it was that these people wrote their log in that we can be *certain* the Incognitans won't know."

"More than that," says B, "we didn't decide who they are or where they were coming from or how they came to crash or anything."

"Come to think of it, though," I point out, "the language and a good many other things must have been decided already because of getting the right hypnotapes and translators on board."

B suddenly lights up.

"Yes, but look, I bet that's what we're here for, I mean that's why

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they picked us instead of Space Department people—the ship's got to have a past history, it has to come from a planet somewhere only no one must ever find out *where* it's supposed to be. Someone will have to fake a log, only I don't see how—"

"The first reel with data showing the planet of origin got damaged during the crash," says Cray impatiently.

"Yes, of course—but we have to find a reason why they were in that part of Space and it has to be a *nice* one, I mean so that the Incognitans when they finally read the log won't hate them any more—"

"Maybe they were bravely defending their own planet by hunting down an interplanetary raider," I suggest.

Cray says it will take only the briefest contact with other planets to convince the Incognitans that interplanetary raiders can't and don't exist, modern planetary alarm and defense systems put them out of the question.

That's all he knows, says B, some interplanetary pirates raided Lizzie's father's farm once Didn't they Liz?"

"Yes in a manner of speaking, but they were bums who pinched a spaceship from a planet not many parsecs away, a sparsely inhabited mining world like my own which had no real call for an alarm system; so that hardly alters the argument."

"Well," says B, "the alarm system on Incognita can't be so hot or the observation ships could not have got in, or out for that matter; unless of course they have some other gadget we don't know about.

"On the other hand," she considers, "to mention Interplanetary raiders raises the idea of Menace in an Unfriendly Universe again, and this is what we want to cancel out.

"These people," she says at last with a visionary look in her eye, "come from a planet which went isolationist and abandoned space travel; now they have built up their civilization to a point where they can build ships of their own again, and the ones on Gilgamesh have cut loose from the ideas of their ancestors that led to their going so far afield—"

"How far afield?" says Cray.

"No one will ever know," I point out to him. "Don't interrupt."

"Anyway," says B, "they set out to rejoin the rest of the Human Race just like the people on *Gilgamesh really* did, in fact a lot of this is the truth only kind of backwards—they were looking for the Cradle of the Race, that's what. Then there was some sort of disaster that threw them off course to land on an uninhabited section of a planet that couldn't understand their signals. And when Incognita finally does take to space flight again I bet the first thing the people do is to try and follow back to where *Gilgamesh* came from and make contact with *them*. It'll become a legend on Incognita—the Lost People . . . the Lost . . . Lost—"

"The Lost Kafoozalum," says Cray. "In other words we switch these people off a war only to send them on a wild goose chase."

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At which a strange voice chimes in, "No, no, no, son, you've got it all *wrong*."

Mr. Yardo is with us like a well-meaning skeleton.

During the next twenty-five minutes we learn a lot about Mr. Yardo including material for a good guess at how he came to be picked for this expedition; doubtless there are many experts on Reversal Of Vacuum-Induced Changes in Organic Tissues but maybe only one of them a Romantic at heart.

Mr. Yardo thinks chasing the Wild Goose will do the Incognitans all the good in the galaxy, it will take their minds off controversies over interhemispherical trade and put them on to the quest of the Unobtainable; they will get to know something of the Universe outside their own little speck. Mr. Yardo has seen a good deal of the Universe in the course of advising on how to recondition space-packed meat and he found it an Uplifting Experience.

We gather he finds this desperate bit of damfoolery we are on now pretty Uplifting altogether.

Cray keeps surprisingly quiet but it is as well that the rest of the party start to trickle in about twenty minutes later the first arrivals remarking Oh *that's* where you've got to!

Presently we are all congregated at one end of the table as before, except that Mr. Yardo is now sitting between B and me; when M'Clare and the colonel come in he firmly stays where he is evidently considering himself One of Us now.

"The proposition," says M'Clare, "is that we intend to take *Gilgamesh* to Incognita and land her there in such a way as to suggest that she crashed. In the absence of evidence to the contrary the Incognitans are bound to assume that that was her intended destination, and the presence of weapons, even disarmed, will suggest that her mission was aggressive. Firstly, can anyone suggest a better course of action? or does anyone object to this one?"

We all look at Lennie who sticks his hands in his pockets and mutters "No."

Kirstly gives her little cough and says there is a point which has not been mentioned.

If a heavily-armed ship crashes on Incognita, will not the government of the hemisphere in which it crashes be presented with new ideas for offensive weapons? And won't this make it more likely that they will start aggression? And won't the fear of this make the other hemisphere even *more* likely to try and get in first before the new weapons are complete?

Hell, I ought to have thought of that.

From the glance of unwilling respect which the colonel bestows on M'Clare it is plain these points have been dealt with.

"The weapons on Gilgamesh were disarmed when she was rediscovered," he says. "Essential sections were removed. The Incognitans won't be

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able to reconstruct how they worked."

Another fact for which we shall have to provide an explanation. Well how about this: The early explorers sent out by these people—the people in Gilgamesh . . . oh, use Cray's word and call them Lost Kafoozalum anyway their ships were armed, but they never found any enemies and the Idealists of B's story refused even to carry arms any more.

(Which is just about what happened when the Terries set out to rediscover the colonies, after all.)

So the Lost Kafoozalum could not get rid of their weapons completely because it would have meant rebuilding the ship; so they just partially dismantled them.

Mr. Yardo suddenly chips in, "About that other point, girlie, surely there must be some neutral ground left on a half-occupied planet like that?" He beams round, pleased at being able to contribute.

B says, "The thing is," and stops.

We wait.

We have about given up hope when she resumes, "The thing is, it will have to be neutral ground of course, only that might easily become a thingummy . . . I mean a, a *casus belli* in itself. So the *other* thing is it ought to be a place which is very hard to get at, so difficult that neither side can really get to it first, they'll have to reach an agreement and co-operate."

"Yeah," says Dillie "that sounds fine, but what sort of place is that?"

I am sorting out in my head the relative merits of mountains, deserts, gorges, et cetera, when I am seized with inspiration at the same time as half the group; we say the same thing in different words and for a time there is Babel, then the idea emerges:

"Drop her into the sea!"

The colonel nods resignedly.

"Yes," he says, "that's what we're going to do."

He presses a button and our projection-screens light up, first with a map of one pole of Incognita, expanding in scale till finally we are looking down on one little bit of coast on one of the polar islands. A glacier descends on to it from mountains inland and there is a bay between cliffs. Then we get a stereo scene of approximately the least hospitable of scenery I ever did see—except maybe when Parvati Lal Dutt's brother made me climb up what he swore was the smallest peak in the Himalayas.

It is a small bay backed by tumbled cliffs. A shelving beach can be deduced from contour and occasional boulders big enough to stick through the snow that smothers it all. A sort of mess of rocks and mud at the back may be the glacial moraine. Over the sea the ice is split in all directions by jagged rifts and channels; the whole thing is a bit like Antractica but nothing is high enough or white enough to uplift the spirit, it looks not only chilly but kind of mean.

"This place," says the colonel, "is the only one, about which we have any topographical information, that

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seems to meet the requirements. Got to know about it through an elementary planetography. One of the observers had the sense to see we might need something of the sort. This place"—the stereo jigs as he taps his projector—"seems it's the center of a rising movement in the crust . . . that's not to the point. Neither side has bothered to claim the land at the poles . . ."

I see their point if it's all like this—". . . And a ship trying to land on those cliffs might very well pitch over into the sea. That is, if she were trying to land on emergency rockets."

Rockets—that brings home the ancientness of this ship *Gilgamesh*—but after all the ships that settled Incognita probably carried emergency rockets, too.

This settled, the meeting turns into a briefing session and merges imperceptibly with the beginning of the job.

The job of course is Faking the background of the crash; working out the past history and present aims of the Lost Kafoozalum. We have to invent a planet and what's more difficult convey all the essential information about it by the sort of sideways hints you gather among peoples' personal possessions; diaries, letters et cetera; and what is even *more* difficult we have to leave out anything that could lead to definite identification of our unknown world with any known one.

We never gave that world a name; it might be dangerous. Who speaks of their world by name, except to strangers? They call it "home"—or "Earth," as often as not.

Some things have been decided for us. Language, for instance—one of two thousand or so Earth tongues that went out of use late enough to be plausible as the main language of a colonized planet. The settlers on Incognita were not the sort to take along dictionaries of the lesser-known tongues, so the computers at Russett had a fairly wide choice.

We had to take a hypnocourse in that language. Ditto the script, one of several forgotten phonetic shorthands. (Designed to enable the tongues of Aliens to be written down; but the Aliens have never been met. It is plausible enough that some colony might have kept the script alive; after all Thasia uses something of the sort to this day.)

The final result of our work looks pretty small. Twenty-three "Personal Background Sets"—a few letters, a diary in some, an assortment of artifacts. Whoever stocked this ship we are on supplied wood, of the half-dozen kinds that have been taken wherever men have gone; stocks of a few plastics—known at the time of the Exodus, or easily developed from those known, and not associated with any particular planet. Also books on Design, a Formwriter for translating drawings into materials, and so on. Someone put in a lot of work before this voyage began.

Most of the time it is like being back on Russet doing a group Project. What we are working on has no

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more and no less reality than that. Our work is all read into a computer and checked against everybody else's. At first we keep clashing. Gradually a consistent picture builds up and gets translated finally into the Personal Background Kits. The Lost Kafoozalum start to exist like people in a History book.

Fifteen days hard work and we have just about finished; then we reach—call it Planet Gilgamesh.

I wake in my bunk to hear that there will be a brief cessation of weight; strap down, please.

We are coming off Mass-Time to go on planetary drive.

Colonel Delano-Smith is in charge of operations on the planet, with Ram and Peter to assist. None of the rest of us see the melting out of fifty years' accumulation of ice, the pumping away of the water, the fitting and testing of the holds for the grappling-beams. We stay inside the ship, on five-eights gee which we do not have time to get used to, and try to work, and discard the results before the computer can do so. There is hardly any work left to do, anyway.

It takes nearly twelve hours to get the ship free, and caulked, and ready to lift. (Her hull has to be patched because of Mr. Yardo's operations which make use of several sorts of vapors). Then there is a queer blind period with Up now one way, now another, and sudden jerks and tugs that upset everything not in gimbals or tied down; interspersed with periods when weightlessness supervenes with no warning at all. After an hour or two of this it would be hard to say whether Mental or physical discomfort is more acute; B consulted, however, says my autonomic system must be quite something, after five minutes *her* thoughts were with her viscera entirely.

Then, suddenly, we are back on Mass-Time again.

Two days to go.

At first being on Mass-Time makes everything seem normal again. By sleep time there is a strain, and next day it is everywhere. I know as well as any that on Mass-Time the greater the mass the faster the shift; all the same I cannot help feeling we are being slowed, dragged back by the dead ship coupled to our live one.

When you stand by the hull *Gilgamesh* is only ten feet away.

I should have kept something to work on like B and Kirsty who have not done their Letters for Home in Case of Accidents; mine is signed and sealed long ago. I am making a good start on a Neurosis when Delano-Smith announces a Meeting for one hour ahead.

Hurrah! now there is a time-mark fixed I think of all sorts of things I should have done before; for instance taking a look at the controls of the Hoppers.

I have been in one of them half an hour and figured out most of the dials—Up down and sideways are controlled much as in a helicar, but here a big viewscreen has been hooked

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in to the autopilot—when across the hold I see the air lock start to move.

Gilgamesh is on the other side.

It takes forever to open. When at last it swings wide on the dark tunnel what comes through is a storage rack, empty, floating on antigrav.

What follows is a figure in a space-suit; modern type, but the windows of the hopper are semipolarized and I cannot make out the face inside the bubble top.

He slings the rack up on the bulkhead, takes off the helmet and hangs that up, too. Then he just stands. I am beginning to muster enough sense to wonder why when he comes slowly across the hold.

Reaching the doorway he says: "Oh, it's you, Lizzie. You'll have to help me out of this. I'm stuck."

M'Clare.

The outside of the suit is still freezing cold; maybe this is what has jammed the fastening. After a few minutes tugging it suddenly gives away. M'Clare climbs out of the suit, leaving it standing, and says, "Help me count these, will you?"

These are a series of transparent containers from a pouch slung at one side of the suit. I recognize them as the envelopes in which we put what are referred to as Personal Background Sets.

I say, "There ought to be twenty-three."

"No," says M'Clare dreamily, "twenty-two, we're saving one of them."

What on earth is the use of an extra set of faked documents and oddments—

He seems to wake up suddenly and says: "What are you doing here, Lizzie?"

I explain and he wanders over to the hopper and starts to explain the controls.

There is something odd about all this. M'Clare is obviously dead tired, but kind of relaxed; seeing that the hour of Danger is only thirty-six hours off I don't understand it. Probably several of his students are going to have to risk their lives—

I am on the point of seeing something important when the speaker announces in the colonel's voice that Professor M'Clare and Miss Lee will report to the Conference Room at once please.

M'Clare looks at me and grins. "Come along, Lizzie. Here's where we take orders for once, you and I."

It is the colonel's Hour. I suppose that having to work with Undergraduates is something he could never quite forget, but from the way he looks at us we might almost be Space Force personnel,—low-grade of course but respectable.

Everything is at last worked out and he has it on paper in front of him; he puts the paper four square on the table, gazes into the middle distance and proceeds to recite.

"One. This ship will go off Mass-Time on 2nd August at 11.27 hours ship's time . . ."

Thirty-six hours from now.

. . . At a point one thousand miles vertically above Co-ordinates 165OE,

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7320S, on Planet Incognita, approximately one hour before midnight local time."

Going on planetary drive as close as that will indicate that something is pretty badly wrong to begin with.

"Two. This ship will descend, coupled to *Gilgamesh* as at present, to a point seventy miles above the planetary surface. It will then uncouple, discharge one hopper, and go back on Mass-Time. Estimated time for this stage of descent forty minutes.

"Three. The hopper will then descend on its own engines at the maximum speed allowed by the heat-disposal system; estimated at thirty-seven minutes. *Gilgamesh* will complete descent in thirty-three minutes. Engines of *Gilgamesh* will not be used except for the heat-disposal and gyro auxiliaries. The following installations have been made to allow for the control of the descent; a ring of eight rockets in peltathene mounts around the tail end, and one outsize antigrav unit inside the nose. "Sympathizer" controls hooked up with a visiscreen and a computer have also been installed in the nose.

"Four. *Gilgamesh* will carry one man only. The hopper will carry a crew of three. The pilot of *Gilgamesh* will establish the ship on the edge of the cliff, supported on antigrav a foot or so above the ground and leaning towards the sea at an angle of approximately 20° with the vertical. Except for this landing will be automatic.

"Five."

The colonel's voice has lulled us into passive acceptance; now we are jerked into sharper attention by the faintest possible check in it.

"The greatest danger attaching to the expedition is that the Incognitans may discover that the crash has been faked. This would be inevitable if they were to capture (a) the hopper; (b) any of the new installations in Gilgamesh, especially the antigrav; (c) any member of the crew.

"The function of the hopper is to pick up the pilot of *Gilgamesh* and also to check that ground appearances are consistent. If not, they will produce a landslip on the cliff edge, using power tools and explosives carried for the purpose. That is why the hopper has a crew of three; but the chance of their having to do this is slight."

So I should think; ground appearances are supposed to show that *Gilgamesh* landed using emergency rockets and then toppled over the cliff and this will be exactly what happened.

"The pilot will carry a one-frequency low-power transmitter activated by the change in magnetic field on leaving the ship. The hopper will remain at five hundred feet until this signal is received. It will then pick up the pilot, check ground appearances, and rendezvous with this ship at two hundred miles up at 18.27 hours."

The ship and the hopper both being radar-absorbent will not register on alarm systems, and by keeping to

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planetary nighttime they should be safe from being seen.

"Danger (b) will be dealt with as follows. The rocket-mounts being of peltathene will be destroyed by half an hour's immersion in water. The installations in the nose will be destroyed with Andite."

Andite produces complete colecular disruption in a very short range, hardly any damage outside it; the effect will be as though the nose broke off on impact; I suppose the Incognitans will waste a lot of time looking for it on the bed of the sea.

"Four ten-centimeter cartridges will be inserted within the nose installations. The fuse will have two alternative settings. The first will be timed to act at 12.50 hours, seven minutes after the estimated time of landing. It will not be possible to deactivate it before 12.45 hours. This takes care of the possibility of the pilot's becoming incapacitated during the descent.

"Having switched off the first fuse the pilot will get the shop into position and then activate a second, timed to blow in ten minutes. He will then leave the ship. When the antigrav is destroyed the ship will, of course, fall into the sea.

"Six. The pilot of *Gilgamesh* will wear a spacesuit of the pattern used by the original crew and will carry Personal Background Set number 23. Should he fail to escape from the ship the crew of the hopper will on no account attempt to rescue him."

The colonel takes up the paper, folds it in half and puts it down one inch further away.

"The hopper's crew" he says, "will give the whole game away should one of them fall into Incognitan hands, alive or dead. Therefore they don't take any risks of it."

He lifts his gaze ceilingwards. "I'm asking for three volunteers."

Silence. Manning the hopper is definitely second best. Then light suddenly bursts on me and I lift my hand and hack B on the ankle.

"I volunteer," I say.

B gives me a most dubious glance and then lifts her hand, too.

Cray on the other side of the table is slowly opening his mouth when there is an outburst of waving on the far side of B.

"Me too, colonel! I volunteer!"

Mr. Yardo proceeds to explain that his special job is over and done, he can be more easily spared than anybody, he may be too old to take charge of *Gilgamesh* but will back himself as a hopper pilot against anybody.

The colonel cuts this short by accepting all three. He then unfolds his paper again.

"Piloting *Gilgamesh,*" he says. "I'm not asking for volunteers now. You'll go to your cabins in four hours' time and those who want to will volunteer, secretly. To a computer hookup. Computer will select on a random basis and notify the one chosen. Give him his final instructions, too. No one need know who it was till it's all over. He can tell anyone he likes, of course."

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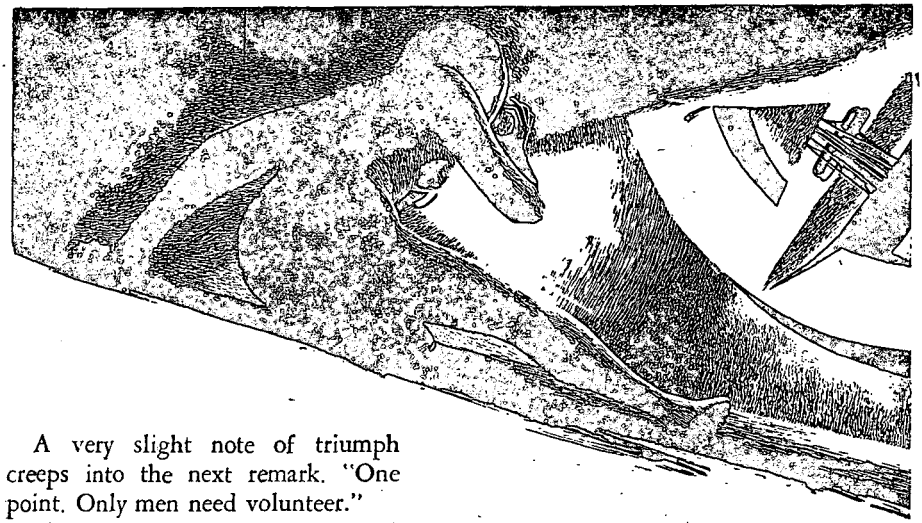

A very slight note of triumph creeps into the next remark. "One point. Only men need volunteer."

Instant outcry from Kirsty and Dilly: B turns to me with a look of awe.

"Nothing to do with prejudice," says the colonel testily. "Just facts. The crew of *Gilgamesh* were all men. Can't risk one solitary woman being found on board. Besides—spacesuits, personal background sets—all designed for men."

Kirsty and Dilly turn on me looks designed to shrivel and B whispers Lizzie how wonderful you are.

The session dissolves. We three get an intensive session course of instruction on our duties and are ordered off to sleep. After breakfast next morning I run into Cray who says Before I continue about what is evidently pressing business would I care to kick him, hard?

Not right now I reply, what for anyway?

"Miss Lee," says Cray, dragging it out longer than ever, "although I have long realized that your brain functions in a way much superior to logic I had not sense enough yesterday to follow my own instinct and do what you do as soon as you did it; therefore that dessicated meat handler got in first."

I say: "So you weren't picked for pilot? It was only one chance in ten."

"Oh," says Cray, "did you really think so?" He gives me a long look and goes away.

I suppose he noticed that when the colonel came out with his remarks about No women in Gilgamesh I was as surprised as any.

Presently the three of us are issued with protective clothing; we just might have to venture out on the planet's surface and therefore we get white one-piece suits to protect against Cold, heat, moisture, dessica-

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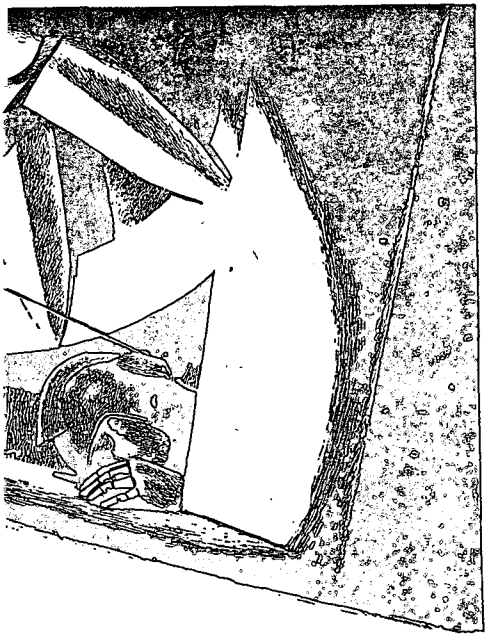

tion, radioactivity and mosquitoes, and they are quite becoming, really.

B and I drag out dressing for thirty minutes; then we just sit while Time crawls asymptotically towards the hour.

Then the speaker calls us to go.

We are out of the cabin before it says two words and racing for the hold; so that we are just in time to see a figure out of an Historical movie —padded, jointed, tin bowl for head and blank reflecting glass where the face should be—stepping through the air lock.

The colonel and Mr. Yardo are there already. The colonel packs us into the hopper and personally closes the door, and for once I know what he is thinking; he is wishing he were *not* the only pilot in this ship who could possibly rely on bringing the ship off and on Mass-Time at one particular defined spot of Space.

Then he leaves us; half an hour to go.

The light in the hold begins to alter. Instead of being softly diffused it separates into sharp-edged beams, reflecting and crisscrossing but leaving cones of shadow between. The air is being pumped into store.

Fifteen minutes.

The hull vibrates and a hatch slides open in the floor so that the black of Space looks through; it closes again.

Mr. Yardo lifts the hopper gently off its mounts and lets it back again.

Testing; five minutes to go.

I am hypnotized by my chronometer; the hands are crawling through glue; I am still staring at it when, at the exact second, we go off Mass-Time.

No weight. I hook my heels under the seat and persuade my esophagus back into place. A new period of waiting has begun. Every so often comes the impression we are falling head-first; the colonel using ship's drive to decelerate the whole system. Then more free fall.

The hopper drifts very slowly out into the hold and hovers over the hatch, and the lights go. There is only the glow from the visiscreen and the instrument board.

One minute thirty seconds to go.

The hatch slides open again. I take a deep breath.

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I am still holding it when the colonel's voice comes over the speaker: "Calling *Gilgamesh*. Calling the hopper. Good-by and Good luck. You're on your own."

The ship is gone.

Yet another stretch of time has been marked off for us. Thirty-seven minutes, the least time allowable if we are not to get overheated by friction with the air. Mr. Yardo is a good pilot; he is concentrating wholly on the visiscreen and the thermometer. B and I are free to look around.

I see nothing and say so.

I did not know or have forgotten that Incognita has many small satellites; from here there are four in sight.

I am still looking at them when B seizes my arm painfully and points below us.

I see nothing and say so.

B whispers it was there a moment ago, it is pretty cloudy down there—Yes Lizzie there it is *look*.

And I see it. Over to the left, very faint and far below, a pin-prick of light.

Light in the polar wastes of a sparsely inhabited planet, and since we are still five miles up it is a very powerful light too.

No doubt about it, as we descend farther; about fifty miles from our objective there are men, quite a lot of them.

I think it is just then that I understand, *really* understand, the hazard of what we are doing. This is not an exercise. This is in dead earnest, and if we have missed an essential factor or calculated something wrong the result will be not a bad mark or a failed exam, or even our personal deaths, but incalculable harm and misery to millions of people we never even heard of.

Dead earnest. How in Space did we ever have cheek enough for this?

The lights might be the essential factor we have missed, but there is nothing we can do about them now.

Mr. Yardo suddenly chuckles and points to the screen.

"There you are, girlies! He's down!"

There, grayly dim, is the map the colonel showed us; and right on the faint line of the cliff-edge is a small brilliant dot.

The map is expanding rapidly, great lengths of coastline shooting out of sight at the edge of the screen. Mr. Yardo has the cross-hairs centered on the dot which is *Gilgamesh*. The dot is changing shape; it is turning into a short ellipse, a longer one. The gyros are leaning her out over the sea.

I look at my chronometer; 12.50 hours exactly. B looks, too, and grips my hand.

Thirty seconds later the Andite has not blown; first fuse safety turned off. Surely she is leaning far enough out by now?

We are hovering at five hundred feet. I can actually see the white edge of the sea beating at the cliff. Mr. Yardo keeps making small corrections; there is a wind out there trying to blow us away. It is cloudy

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here: I can see neither moons nor stars.

Mr. Yardo checks the radio. Nothing yet.

I stare downwards and fancy I can see a metallic gleam.

Then there is a wordless shout from Mr. Yardo; a bright dot hurtles across the screen and at the same time I see a streak of blue flame tearing diagonally downwards a hundred feet away.

The hopper shudders to a flat concussion in the air, we are all thrown off balance, and when I claw my way back to the screen the moving dot is gone.

So is *Gilgamesh*.

B says numbly, "But it wasn't a meteor. It can't have been."

"It doesn't matter what it was," I say. "It was some sort of missile, I think. They must be even nearer to war than we thought."

We wait. What for, I don't know. Another missile, perhaps. No more come.

At last Mr. Yardo stirs. His voice sounds creaky.

"I guess," he says, then clears his throat, and tries again. "I guess we have to go back up."

B says, "Lizzie, who was it? Do you know?"

Of course I do. "Do you think M'Clare was going to risk one of us on that job? The volunteering was a fake. He went himself."

B whispers, "You're just guessing."

"Maybe," says Mr. Yardo, "but I happened to see through that face plate of his. It was the professor all right."

He has his hand on the controls when my brain starts working again. I utter a strangled noise and dive for the hatch into the cargo hold. B tries to grab me but I get it open and switch on the light.

Fifty-fifty chance—I've lost.

No, this is the one we came in and the people who put in the new cargo did not clear out my fish-boat, they just clamped it neatly to the wall.

I dive in and start to pass up the package. B shakes her head.

"No, Lizzie. We can't. Don't you remember? If we got caught, it would give everything away. Besides . . . there isn't any chance—"

"Take a look at the screen," I tell her.

Sharp exclamation from Mr. Yardo. B turns to look, then takes the package and helps me back.

Mr. Yardo maneuvers out over the sea till the thing is in the middle of the screen; then drops to a hundred feet. It is sticking out of the water at a fantastic angle and the waves are hardly moving it. The nose of a ship.

"The antigrav," whispers B. "The Andite hasn't blown yet."

"Ten minutes," says Mr. Yardo thoughtfully. He turns to me with sudden briskness. "What's that, Lizzie girl? A fish-boat? Good. We may need it. Let's have a look."

"It's mine," I tell him.

"Now look—"

"Tailor made," I say. "You might

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get into it, though I doubt it. You couldn't work the controls."

It takes him fifteen seconds to realize there is no way round it; he is six foot three and I am five foot one. Even B would find it hard.

His face goes grayish and he stares at me helplessly. Finally he nods.

"All right, Lizzie. I guess we have to try it. Things certainly can't be much worse than they are. We'll go over to the beach there."

On the beach there is wind and spray and breakers but nothing unmanageable; the cliffs on either side keep off the worst of the force. It is queer to feel moving air after eighteen days in a ship. It takes six minutes to unpack and expand the boat and by that time it is ten minutes since the missile hit and the Andite has not blown.

I crawl into the boat. In my protective clothing it is a fairly tight fit. We agree that I will return to this same point and they will start looking for me in fifty minutes' time and will give up if I have not returned in two hours. I take two Andite cartridges to deal with all eventualities and snap the nose of the boat into place. At first I am very conscious of the two little white cigars in the pouch of my suit, but presently I have other things to think about.

I use the "limbs" to crawl the last few yards of shingle into the water and on across the sea bottom till I am beyond the line of breakers; then I turn on the motor. I have already set the controls to "home" on *Gilgamesh* and the radar will steer me off any obstructions. This journey in the dark is as safe as my trip around the reefs before all this started—though it doesn't feel that way.

It takes twelve minutes to reach *Gilgamesh,* or rather the fragment that antigrav is supporting; it is about half a mile from the beach.

The radar stops me six feet from her and I switch it off and turn to Manual and inch closer in.

Lights, a very small close beam. The missile struck her about one third of her length behind the nose. I know, because I can see the whole of that length. It is hanging just above the water, sloping at about 30° to the horizontal. The ragged edge where it was torn from the rest is just dipping into the sea.

If anyone sees this, I don't know what they will make of it but no one could possibly think an ordinary spaceship suffered an ordinary crash, and very little investigation would show up the truth.

I reach up with the forward set of "limbs" and grapple on to the break. I now have somehow to get the hind set of "limbs" up without losing my grip. I can't.

It takes several minutes to realize that I can just open the nose and crawl out.

Immediately a wave hits me in the face and does its best to drag me into the sea. However the interior of the ship is relatively sheltered and presently I am inside and dragging the boat up out of reach.

I need light. Presently I manage to detach one of the two from the

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boat. I turn it down to minimum close beam and hang it round my neck; then I start up the black jag-edged tunnel of the ship.

I have to get to the nose, find the fuse, change the setting to twenty minutes—maximum possible—and get out before it blows—out of the water I mean. The fish-boat is not constructed to take explosions even half a mile away. But the first thing is to find the fuse and I cannot make out how *Gilgamesh* is lying and therefore cannot find the door through this bulkhead; everything is ripped and twisted. In the end I find a gap between the bulkhead itself and the hull, and squeeze through that.

In the next compartment things are more recognizable and I eventually find the door. Fortunately ships are designed so that you can get through doors even when they are in the ceiling; actually here I have to climb up an overhang, but the surface is provided with rungs which make it not too bad. Finally I reach the door. I shall have to use antigrav to get down . . . why didn't I just turn it on and jump? I forgot I had it.

The door was a little way open when the missile struck; it buckled in its grooves and is jammed fast. I can get an arm through. No more. I switch on antigrav and hang there directing the light round the compartment. No rents anywhere, just buckling. This compartment is divided by a partition and the door through that is open. There will be another door into the nose on the other side.

I bring back my feet ready to kick off on a dive through that doorway.

Behind me, something stirs.

My muscles go into a spasm like the one that causes a falling dream, my hold tears loose and I go tumbling through the air, rebound from a wall, twist, and manage to hook one foot in the frame of the door I was aiming for. I pull myself down and turn off the antigrav; then I just shake for a bit.

The sound was—

This is stupid, with everything torn to pieces in this ship there is no wonder if bits shake loose and drop around—

But it was not a metallic noise, it was a kind of soft dragging, very soft, that ended in a little thump.

Like a—

Like a loose piece of plastic dislodged from its angle of rest and slithering down, pull yourself together Lizzie Lee.

I look through the door into the other half of this level. Shambles. Smashed machinery every which way, blocking the door, blocking everything. No way through at all.

Suddenly I remember the tools. Mr. Yardo loaded the fish-boat with all it would take. I crawl back and return with a fifteen inch expanding beam-lever, and overuse it; the jammed trap door does not slide back in its grooves but flips right out of them, bent double; it flies off into the dark and clangs its way to rest.

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I am halfway through the opening when I hear the sound again. A soft slithering; a faint defeated thump.

I freeze where I am, and then I hear the sigh; a long, long weary sound, almost musical.

An air leak somewhere in the hull and wind or waves altering the air pressure below.

All the same I do not seem able to come any farther through this door.

Light might help; I turn the beam up and play it cautiously around. This is the last compartment, right in the nose; a sawn-off cone-shape. No breaks here, though the hull is buckled to my left and the "floor"—the partition, horizontal when the ship is in the normal operating position, which holds my trap door—is torn up; some large heavy object was welded to a thin surface skin which has ripped away leaving jagged edges and a pattern of girders below.

There is no dust here; it has all been sucked out when the ship was open to space; nothing to show the beam except the sliding yellow ellipse where it touches the wall. It glides and turns, spiraling down, deformed every so often where it crosses a projection or a dent, till it halts suddenly on a spoked disk, four feet across and standing nearly eighteen inches out from the wall. The antigrav.

I never saw one this size, it is like the little personal affairs as a giant is like a pigmy, not only bigger but a bit different in proportion. I can see an Andite cartridge fastened among the spokes.

The fuse is a "sympathizer" but it is probably somewhere close. The ellipse moves again. There is no feeling that I control it; it is hunting on its own. To and fro around the giant wheel. Lower. It halts on a small flat box, also bolted to the wall, a little way below. This is it, I can see the dial.

The ellipse stands still, surrounding the fuse. There is something at the very edge of it.

When *Gilgamesh* was right way up the antigrav was bolted to one wall, about three feet above the floor. Now the lowest point is the place where this wall joins what used to be the floor. Something has fallen down to that point and is huddled there in the dark.

The beam jerks suddenly up and the breath whoops out of me; a round thing sticking out of the wall —then I realize it is an archaic space-helmet, clamped to the wall for safety when the wearer took it off.

I take charge of the ellipse of light and move it slowly down, past the fuse, to the thing below. A little dark scalloping of the edge of the light. The tips of fingers. A hand.

I turn up the light.

When the missile struck the big computer was wrenched loose from the floor. It careened down as the floor tilted, taking with it anything that stood in its way.

M'Clare was just stooping to the fuse, I think. The computer smashed against his legs and pinned him down in the angle between the wall and the floor. His legs are hidden by it.

Because of the spacesuit he does

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not looked crushed; the thick clumsy joints have kept their roundness, so far as they are visible; only his hands and head are bare and vulnerable looking.

I am halfway down, floating on minimum gravity, before it really occurs to me that he may be still alive.

I switch to half and drop beside him. His face is colorless but he is breathing all right.

First-aid kit. I will never make fun of Space Force thoroughness again. Rows and rows of small plastic ampoules. Needles.

Pain-killer, first. I read the directions twice, sweating. Emergencies only—this is. One dose *only* to be given and if patient is not in good health use—never mind that. I fit on the longest needle and jab it through the suit, at the back of the thigh, as far towards the knee-joint as I can get because the suit is thinner. Half one side, half the other.

Now to get the computer off. At a guess it weighs about five hundred pounds. The beam-lever would do it but it would probably fall back.

Antigrav; the personal size is supposed to take up to three times the weight of the average man. I take mine off and buckle the straps through a convenient gap. I have my hands under the thing when M'Clare sighs again.

He is lying on his belly but his head is turned to one side, towards me. Slowly his eyelids open. He catches sight of my hand; his head moves a little, and he says, "Lizzie. Golden Liz."

I say not to worry, we will soon be out of here.

His body jumps convulsively and he cries out. His hand reaches my sleeve and feels. He says, "Liz! Oh, God, I thought . . . what—"

I say things are under control and just keep quiet a bit.

His eyes close. After a moment he whispers, 'Something hit the ship."

"A homing missile, I think."

I ought not to have said that; but it seems to make no particular impression, maybe he guessed as much.

I was wrong in wanting to shift the computer straight away, the release of pressure might start a hemorrhage; I dig out ampoules of blood-seal and inject them into the space between the suit and the flesh, as close to the damage as I can.

M'Clare asks how the ship is lying and I explain, also how I got here. I dig out the six-by-two-inch packet of expanding stretcher and read the directions. He is quiet for a minute or two, gathering strength; then he says sharply: "Lizzie. Stop that and listen.

"The fuse for the Andite is just under the antigrav. Go and find it. Go *now*. There's a dial with twenty divisions. Marked in black—you see it. Turn the pointer to the last division. Is that done?

"Now you see the switch under the pointer? Is your boat ready? I beg your pardon, of course you left it that way. Then turn the switch and get out."

I come back and see by my chrono

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that the blood-seal should be set; I get my hands under the computer. M'Clare bangs his hand on the floor.

"Lizzie, you little idiot, don't you realize that even if you get me out of this ship, which is next to impossible, you'll be delayed all the way—and if the Incognitans find either of us the whole plan's ruined? Much worse than ruined, once they see it's a hoax—"

I tell him I have two Andite sticks and they won't find us and on a night like this any story of explosions will be put down to sudden gusts or to lightning.

He is silent for a moment while I start lifting the computer, carefully; its effective weight with the antigrav full on is only about twenty pounds but it has all its inertia. Then he says quietly, "Please, Lizzie—can't you understand that the worst nightmare in the whole affair has been the fear that one of you might get injured? Or even killed? When I realized that only one person was needed to pilot *Gilgamesh*—it was the greatest relief I ever experienced. Now you say . . ." His voice picks up suddenly. "Lizzie, you're beaten anyway. The . . . I'm losing all feeling. Even pain. I can't feel anything behind my shoulders . . . it's creeping up—"

I say that means the pain-killer I shot him with is acting as advertised, and he makes a sound as much like an explosive chuckle as anything and it quiet again.

The curvature between floor and wall is not helpful, I am trying to find a place to wedge the computer so it cannot fall back when I take off the antigrav. Presently I get it pushed on to a sort of ledge formed by a dent in the floor, which I think will hold it. I ease off the antigrav and the computer stays put, I don't like the looks of it so let's get out of here.

I push the packaged stretcher under his middle and pull the tape before I turn the light on to his legs to see the damage. I cannot make out very much; the joints of the suit are smashed some, but as far as I can see the inner lining is not broken which means it is still air-and-water-tight.

I put a hand under his chest to feel how the stretcher is going; it is now expanded to eighteen inches by six and I can feel it pushing out, but it is *slow,* what else have I to do—oh yes, get the helmet.

I am standing up to reach for it when M'Clare says, "What are you doing? Yes . . . well, don't put it on for a minute. There's something I would like to tell you, and with all respect for your obstinacy I doubt very much whether I shall have another chance. Keep that light off me, will you? It hurts my eyes.

"You know, Lizzie, I dislike risking the lives of any of the students for whom I am responsible, but as it happens I find the idea of you—blowing yourself to atoms particularly objectionable because . . . I happen to be in love with you. You're also one of my best students, I used to think that . . . was why I'd been so insistent on your coming to Russett, but I rather think . . . my motives were mixed even then. I meant to

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tell you this after you graduated, and to ask you to marry me, not that . . I thought you would, I know quite well . . . you never quite forgave me, but I don't-want-to-have to remember . . . I didn't . . have the guts to—"

His voice trails off, I get a belated rush of sense to the head and turn the light on his face. His head is turned sideways and his fist is clenched against the side of his neck. When I touch it his hand falls open and five discharged ampoules fall out.

Pain-killer.

Maximum dose, one ampoule.

All that talk was just to hold my attention while he fixed the needles and—

I left the kit spread out right next to him.

While I am taking this in some small cold corner of my mind is remembering the instructions that are on the pain-killer ampoule; it does not say, outright, that it is the last refuge for men in the extremity of pain and despair; therefore it cannot say, outright, that they sometimes despair too soon; but it does tell you the name of the antidote.

There are only three ampoules of this and they also say, maximum dose one ampoule. I try to work it out but lacking all other information the best I can do is inject two and keep one till later. I put that one in my pocket.

The stretcher is all expanded now; a very thin but quite rigid grid, six feet by two; I lash him on it without changing his position and fasten the helmet over his head.

Antigrav; the straps just go round him and the stretcher.

I point the thing up towards the trap door and give it a gentle push; then I scramble up the rungs and get there just in time to guide it through. It takes a knock then and some more while I am getting it down to the next partition, but he can't feel it.

This time I find the door, because the roar of noise behind it acts as a guide. The sea is getting up and is dashing halfway to the door as I crawl through. My boat is awash, pivoting to and fro on the grips of the front "limbs."

I grab it, release the limbs and pull it as far back as the door. I maneuver the stretcher on top and realize there is nothing to fasten it with . . . except the antigrav, I get that undone, holding the stretcher in balance, and manage to put it under the stretcher and pass the straps between the bars of the grid . . . then round the little boat, and the buckle just grips the last inch. It will hold, though.

I set the boat to face the broken end of the ship, but I daren't put it farther back than the doorway; I turn the antigrav to half, fasten the limb-grips and rush back towards the nose of the ship. Silver knob under the dial. I turn it down, hear the thing begin a fast, steady ticking, and turn and run.

Twenty minutes.

One and a half to get back to the boat, four to get inside it without

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overturning. Nearly two to get down to the sea—balance difficult. One and a half to lower myself in.

Thirty seconds' tossing before I sink below the wave layer; then I turn the motor as high as I dare and head for the shore.

In a minute I have to turn it down; at this speed the radar is bothered by water currents and keeps steering me away from them as though they were rocks; I finally find the maximum safe speed but it is achingly slow. What happens if you are in water when Andite blows half a mile away? A moment's panic as I find the ship being forced up, then I realize I have reached the point where the beach starts to shelve, turn off radar and motor and start crawling. Eternal slow reach out, grab, shove, haul, with my heart in my mouth; then suddenly the nose breaks water and I am hauling myself out with a last wave doing its best to overbalance me.

I am halfway out of the boat when the Andite blows behind me. There is a flat slapping sound; then an instant roar of wind as the air receives the binding energies of several tons of matter; then a long wave comes pelting up the beach and snatches at the boat.

I huddle into the shingle and hold the boat; I have just got the antigrav turned off, otherwise I think it would have been carried away. There are two or three more big waves and a patter of spray; then it is over.

The outlet valve of the helmet is working, so M'Clare is still breathing; very deep, very slow.

I unfasten the belt of the antigrav, having turned it on again, and pull the belt through the buckle. No time to take it off and rearrange it; anyway it will work as well under the stretcher as on top of it. I drag the boat down to the water, put in an Andite cartridge with the longest fuse I have, set the controls to take it straight out to sea at maximum depth the radar control will allow—six feet above bottom—and push it off. The other Andite cartridge starts burning a hole in my pocket; I would have liked to put that in too, but I must keep it, in case.

I look at my chrono and see that in five minutes the hopper will come.

Five minutes.

I am halfway back to the stretcher when I hear a noise further up the beach. Unmistakable. Shingle under a booted foot.

I stand frozen in mid-stride. I turned the light out after launching the boat but my eyes have not recovered yet; it is murkily black. Even my white suit is only the faintest degree paler than my surroundings.

Silence for a couple of minutes. I stand still. But it can't have gone away. What happens when the hopper comes? They will see whoever it is on the infrared vision screen. They won't come—

Footsteps again. Several.

Then the clouds part and one of those superfluous little moons shines straight through the gap.

The bay is not like the stereo the

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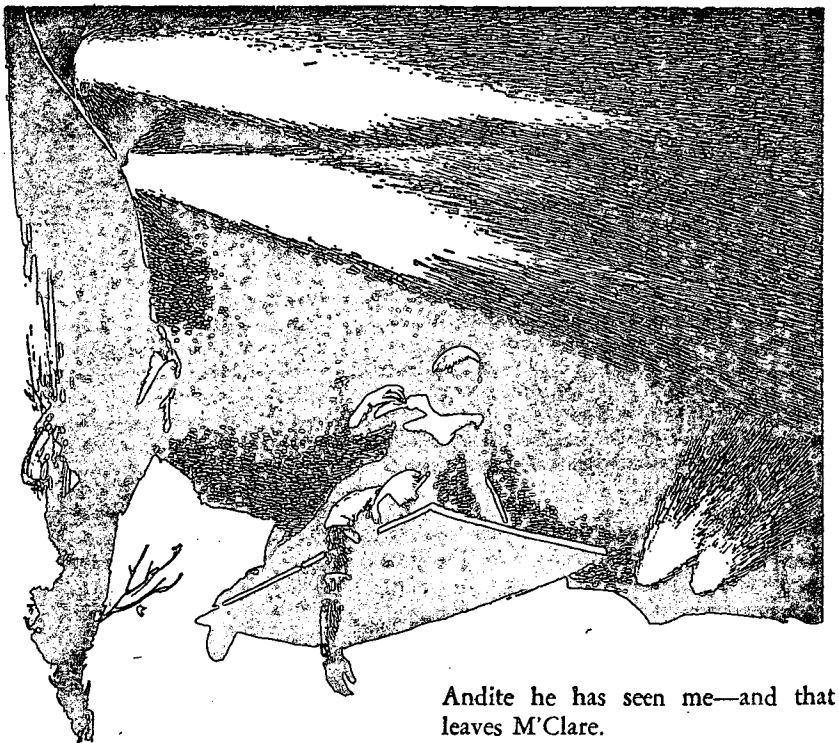

colonel showed because that was taken in winter; now the snow is melted, leaving bare shingle and mud and a tumble of rocks; more desolate than the snow. Fifty feet off is a man.

He is huddled up in a mass of garments but his head is bare, rising out of a hood which he has pushed back, maybe so as to listen better; he looks young, hardly older than me. He is holding a long thin object which I never saw before, but it must be a weapon of some sort.

This is the end of it. All the evidence of faking is destroyed; except M'Clare and me. Even if I use the Andite he has seen me—and that leaves M'Clare.

I am standing here on one foot like a dancer in a jammed movie, waiting for Time to start again or the world to end—

Like the little figure in the dance-instruction kit Dad got when I was seven, when you switched her off in the middle.

Like a dancer—

My weight shifts on to the forward foot. My arms swing up, forwards, back. I take one step, another.

Swing. Turn. Kick. Sideways.

Like the silly little dancer who could not get out of the plastic block; but I am moving forward little by

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little, even if I have to take three steps roundabout for every one in advance.

Arms, up. Turn, round. Leg, up. Straighten, out. Step.

Called the Dance of the Little Robot, for about three months Dad thought it was no end cute, till he caught on I was thinking so, too.

It is just about the only kind of dance you could do on shingle, I guess.

When this started I thought I might be going crazy, but I just had not had time to work it out. In terms of Psychology it goes like this; to shoot off a weapon a man needs a certain type of Stimulus like the sight of an enemy over the end of it. So if I do my best not to look like an enemy he will not get that Stimulus. Or put it another way most men think twice before shooting a girl in the middle of a dance. If I should happen to get away with this, nobody will believe his story, he won't believe it himself.

As for the chance of getting away with it, i.e., getting close enough to grab the gun or hit him with a rock or something, I know I would become a Stimulus to shooting before I did that but there are always the clouds, if one will only come back over the moon again.

I have covered half the distance.

Twenty feet from him, and he takes a quick step back.

Turn, kick, out, step. I am swinging round away from him, let's hope he finds it reassuring. I dare not look up but I think the light is dimming. Turn, kick, out, step. Boxing the compass. Coming round again.

And the cloud is coming over the moon, out of the corner of my eye I see darkness sweeping towards us —and I see his face of sheer horror as he sees it, too; he jumps back, swings up the weapon, and fires straight in my face.

And it is dark. So much for Psychology.

There is a clatter and other sounds—

Well, quite a lot for Psychology maybe, because at twenty feet he seems to have missed me.

I pick myself up and touch something which apparently is his weapon, gun or whatever. I leave it and hare back to the stretcher, next-to fall over it but stop just in time, and switch on the antigrav. Up; level it; now where to? The cliffs enclosing the bay are about thirty yards off to my left and they offer the only cover.

The shingle is relatively level; I make good time till I stumble against a rock and nearly lose the stretcher. I step up on to the rock and see the cliff as a blacker mass in the general darkness, only a yard away. I edge the stretcher round it.

It is almost snatched out of my hand by a gust of wind. I pull it back and realize that in the bay I have been sheltered; there is pretty near half a gale blowing across the face of the cliff.

Voices and footsteps, away back among the rocks where the man came from.

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If the clouds part again they will see me, sure as shooting.

I take a hard grip on the stretcher and scramble round the edge of the cliff.

After the first gust the wind is not so bad; for the most part it is trying to press me back into the cliff. The trouble is that I can't see. I have to shuffle my foot forward, rubbing one shoulder against the cliff to feel where it is because I have no hand free.

After a few yards I come to an impasse; something more than knee high; boulder, ridge, I can't tell.

I weigh on the edge of the stretcher and tilt it up to get it over the obstacle. With the antigrav full on it keeps its momentum and goes on moving up. I try to check it, but the wind gets underneath.

It is tugging to get away; I step blindly upwards in the effort to keep up with it. One foot goes on a narrow ledge, barely a toe hold. I am being hauled upwards. I bring the other foot up and find the top of a boulder, just within reach. Now the first foot—

And now I am on top of the boulder, but I have lost touch with the cliff and the full force of the wind is pulling the stretcher upwards. I get one arm over it and fumble underneath for the control of the antigrav; I must give it weight and put it down on this boulder and wait for the wind to drop.

Suddenly I realize that my weight is going; bending over the stretcher puts me in the field of the antigrav. A moment later another gust comes, and I realize I am rising into the air.

Gripping the edge of the stretcher with one hand I reach out the other, trying to grasp some projection on the face of the cliff. Not being able to see I simply push farther away till it is out of reach.

We are still rising.

I pull myself up on the stretcher; there is just room for my toes on either side of M'Clare's legs. The wind roaring in my ears makes it difficult to think.

Rods of light slash down at me from the edge of the cliff. For a moment all I can do is duck; then I realize we are still well below them, but rising every moment. The cliff-face is about six feet away; the wind reflecting from it keeps us from being blown closer.

I must get the antigrav off. I let myself over the side of the stretcher, hanging by one hand, and fumble for the controls. I can just reach. Then I realize this is no use. Antigrav controls are not meant to go off with a click of the finger; they might get switched off accidentally. To work the switch and the safety you must have two hands, or one hand in the optimum position. My position is about as bad as it could be. I can stroke the switch with one finger; no more.

I haul myself back on to the stretcher and realize we are only about six feet under the beam of light. Only one thing left. I feel in my pocket for the Andite. Stupidly, I am still also bending over the outlet

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valve of the helmet, trying to see whether M'Clare is still breathing or not.

The little white cigar is not fused. I have to hold on with one hand. In the end I manage to stick the Andite between thumb and finger-roots of that hand while I use the other to find the fuse and stick it over the Andite. The shortest; three minutes.

I think the valve is still moving—

Then something drops round me; I am hauled tight against the stretcher; we are pulled strongly downwards with the wind buffeting and snatching, banged against the edge of something, and pulled through into silence and the dark.

For a moment I do not understand; then I recognize the feel of Fragile Cargo, still clamping me to the stretcher, and I open my mouth and scream and scream.

Clatter of feet. Hatch opens. Fragile Cargo goes limp.

I stagger to my feet. Faint light through the hatch; B's head. I hold out the Andite stick and she turns and shouts; and a panel slides open in the wall so that the wind comes roaring in.

I push the stick through and the wind snatches it away and it is gone.

After that—

After that, for a while, nothing, I suppose, though I have no recollection of losing consciousness; only without any sense of break I find I am flat on my back on one of the seats in the cabin of the hopper.

I sit up and say "How—"

B who is sitting on the floor beside me says that when the broadcaster was activated of course they came at once, only while they were waiting for the boat to reach land whole squads of land cars arrived and started combing the area, and some came up on top of the cliff and shone their headlights out over the sea so Mr. Yardo had to lurk against the cliff face and wait till I got into a position where he could pick me up and it was *frightfully* clever of me to think of floating up on antigrav—

I forgot about the broadcaster.

I forgot about the hopper come to that, there seemed to be nothing in the world except me and the stretcher and the enemy.

Stretcher.

I say, "Is M'Clare—"

At which moment Mr. Yardo turns from the controls with a wide smile of triumph and says "Eighteen twenty-seven, girls!" and the world goes weightless and swings upside down.

Then still with no sense of any time-lapse I am lying in the big lighted hold, with the sound of trampling all round: it is somehow filtered and far off and despite the lights there seems to be a globe of darkness around my head. I hear my own voice repeating, "M'Clare? How's M'Clare?"

A voice says distantly, without emphasis, "M'Clare? He's dead."

The next time I come round it is dark. I am vaguely aware of having been unconscious for quite a while.

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There is a single thread of knowledge connecting this moment with the last: M'Clare's dead.

This is the central factor: I seem to have been debating it with myself for a very long time.

I suppose the truth is simply that the Universe never guarantees anything; life, or permanence, or that your best will be good enough.

The rule is that you have to pick yourself up and go on; and lying here in the dark is not doing it.

I turn on my side and see a cluster of self-luminous objects including a light switch. I reach for it.

How did I get into a hospital?

On second thoughts it is a cabin in the ship, or rather two of them with the partition torn out, I can see the ragged edge of it. There is a lot of paraphernalia around; I climb out to have a look.

Holy horrors what's happened? Someone borrowed my legs and put them back wrong; my eyes also are not functioning well, the light is set at Minimum and I am still dazzled. I see a door and make for it to get Explanations from somebody.

Arrived, I miss my footing and stumble against the door and on the other side someone says "Hello, Lizzie. Awake at last?"

I think my heart stops for a moment. I can't find the latch. I am vaguely aware of beating something with my fists, and then the door gives, sticks, gives again and I stumble through and land on all fours the other side of it.

Someone is calling: "Lizzie! Are you hurt? Where the devil have they all got to? Liz!"

I sit up and say, "They said you were *dead!*"

"*Who* did?"

"I . . . I . . . someone in the hold. I said How's M'Clare? and they said you were dead."

M'Clare frowns and says gently, "Come over here and sit down quietly for a bit. You've been dreaming."

Have I? Maybe the whole thing was a dream—but if so how far does it go? Going down in the heli? The missile? The boat? crawling through the black tunnel of a broken ship?

No, because he is sitting in a sort of improvised chaise longue and his legs are evidently strapped in place under the blanket; he is fumbling with the fastenings or something.

I say "Hey! Cut that out!"

He straightens up irritably.

"Don't *you* start that, Lysistrata. I've been suffering the attentions of the damnedest collection of amateur nurses who ever handled a thermocouple, for over a week. I don't deny they've been very efficient, but when it comes to—"

Over a *week?*

He nods. "My dear Lizzie, we left Incognita ten days ago. Amateur nursing again! They have some unholy book of rules which says that for Exposure, Exhaustion and Shock the best therapy is sleep. I don't doubt it, but it goes on to say that in extreme cases the patient has been known to benefit by as much as two weeks of it. I didn't find out that they were trying

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it on you until about thirty-six hours ago when I began inquiring why you weren't around. They kept *me* under for three days—in fact until their infernal Handbook said it was time for my leg muscles to have some exercise. Miss Lammergaw was the ringleader."

No wonder my legs feel as though someone exchanged the muscles for cotton wool, just wait till I get hold of Kirsty.

If it hadn't been for her, I shouldn't have spent ten days remembering, even in my sleep, that—

I say, "Hell's feathers, it was *you!*"

M'Clare makes motions as though to start getting out of his chair, looking seriously alarmed. I say, "It was your voice! When I asked—"

M'Clare, quite definitely, starts to blush. Not much, but some.

"Lizzie, I believe you're right. I have a sort of vague memory of someone asking how I was—and I gave what I took to be a truthful answer. I remember it seemed quite inconceivable that I could be alive. In fact I still don't understand it. Neither Yardo nor Miss Laydon could tell me. How *did* you get me out of that ship?"

Well, I do my best to explain, glossing over one or two points; at the finish he closes his eyes and says nothing for a while.

Then he says, "So except for this one man who saw you, you left no traces at all?"

Not that I know of, but—

"Do you know, five minutes later there were at least twenty men in that bay, most of them scientists? They don't seem to have found anything suspicious. Visibility was bad, of course, and you can't leave footprints in shingle—"

Hold on, what *is* all this?

M'Clare says, "We've had two couriers while you were asleep. Yes, I know it's not ordinarily possible for a ship on Mass-Time to get news. One of these days someone will have an interesting problem in Cultural Engineering, working out how to integrate some of these Space Force secrets into our economic and social structure without upsetting the whole of the known volume. Though courier boats make their crews so infernally sick I doubt whether the present type will ever come into common use. Anyway, we've had transcripts of a good many broadcasts from Incognita, the last dated four days ago; and as far as we can tell they're interpreting *Gilgamesh* just as we meant them to.

"The missile, by the way, was experimental, waiting to be test-fired the next day. The man in charge saw *Gilgamesh* on the alarm screens and got trigger-happy. The newscasters were divided as to whether he should be blamed or praised; they all seem to feel he averted a menace, at least temporarily, but some of them think the invaders could have been captured alive.

"The first people on the scene came from a scientific camp; you and Miss Laydon saw their lights on the way down. You remember that area

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is geophysically interesting? Well, by extraordinary good luck an international group was there studying it. They rushed straight off to the site of the landing—they actually saw *Gilgamesh,* and she registered on some of their astronomical instruments, too. They must be a reckless lot. What's more, they started trying to locate her on the sea bottom the next day. Found both pieces; they're still trying to locate the nose. They were all set to try raising the smaller piece when their governments both announced in some haste that they were sending a properly equipped expedition. Jointly.

"There's been no mention in any newscast of anyone seeing fairies or sea maidens—I expect the poor devil thinks you were an hallucination."

So we brought it off.

I am very thankful in a distant sort of way, but right now the Incognitans have no more reality for me than the Lost Kafoozalum.

M'Clare came through alive.

I could spend a good deal of time just getting used to that fact, but there is something I ought to say and I don't know how.

I inquire after his injuries and learn they are healing nicely.

I look at him and he is frowning.

He says, "Lizzie. Just before my well-meant but ineffective attempt at suicide—"

Here it comes.

I say quick If he is worrying about all that nonsense he talked in order to distract my attention, forget it; I have.

Silence, then he says wearily, "I talked nonsense, did I?"

I say there is no need to worry, under the circumstances anyone would have a perfect right to be raving off his Nut.

I then find I cannot bear this conversation any longer so I get up saying I expect he is tired and I will call someone.

I get nearly to the door when

"*No,* Lizzie! you can't let that crew loose on me just in order to change the conversation. Come back here. I appreciate your wish to spare my feelings, but it's wasted. We'll have this out here and now.

"I remember quite well what I said, and so do you: I said that I loved you. I also said that I had intended to ask you to marry me as soon as you ceased to be one of my pupils. Well, the results of Finals were officially announced three days ago.

"Oh, I suppose I always knew what the answer would be, but I didn't want to spend the rest of my life wondering, because I never had the guts to ask you.

"You don't dislike me as you used to—you've forgiven me for making you come to Russett—but you still think I'm a cold-blooded manipulator of other people's minds and emotions. So I am; it's part of the job.

"You're quite right to distrust me for that, though. It is the danger of this profession, that we end up by looking on everybody and everything

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as a subject for manipulation. Even in our personal lives. I always knew that: I didn't begin to be afraid of it until I realized I was in love with you.

"I could have made you love me, Lizzie. I could! I didn't try. Not that I didn't want love on those terms, or any terms. But to use professional . . . tricks . . . in private life, ends by destroying all reality. I always treated you exactly as I treated my other students—I think. But I could have made you think you loved me . . . even if I am twice your age—"

This I cannot let pass, I say "Hi! According to College rumor you cannot be more than thirty-six; I'm twenty-three."

M'Clare says in a bemused sort of way He will be thirty-seven in a couple of months.

I say, "I will be twenty-four next week and your arithmetic is still screwy; and here is another datum you got wrong. I do love you. Very much."

He says, "Golden Liz."

Then other things which I remember all right, I shall keep them to remember any time I am tired, sick, cold, hungry Hundred-and-ninety—; but they are not for writing down.

Then I suppose at some point we agreed it is time for me to go, because I find myself outside the cabin and there is Colonel Delano-Smith.

He makes me a small speech about various matters ending that he hears he has to congratulate me.

Huh?

Oh Space and Time did one of those unmitigated so-and-sos, my dear classmates, leave M'Clare's communicator on?

The colonel says he heard I did very well in my Examinations.

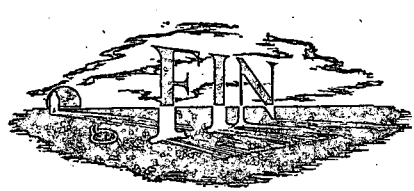
Sweet splitting photons I forgot all about Finals.

It is just as well my Education has come to an honorable end, because . . . well, shades of . . . well, Goodness gracious and likewise Dear me, I am going to marry a *Professor*.

Better just stick to it I am going to marry M'Clare, it makes better sense that way.

But Gosh we are going to have to do some re-adjusting to a changed Environment. Both of us.

Oh, well, M'Clare is Professor of Cultural Engineering and I just past my Final Exams in same; surely if anyone can we should be able to work out how you live Happily Ever After?



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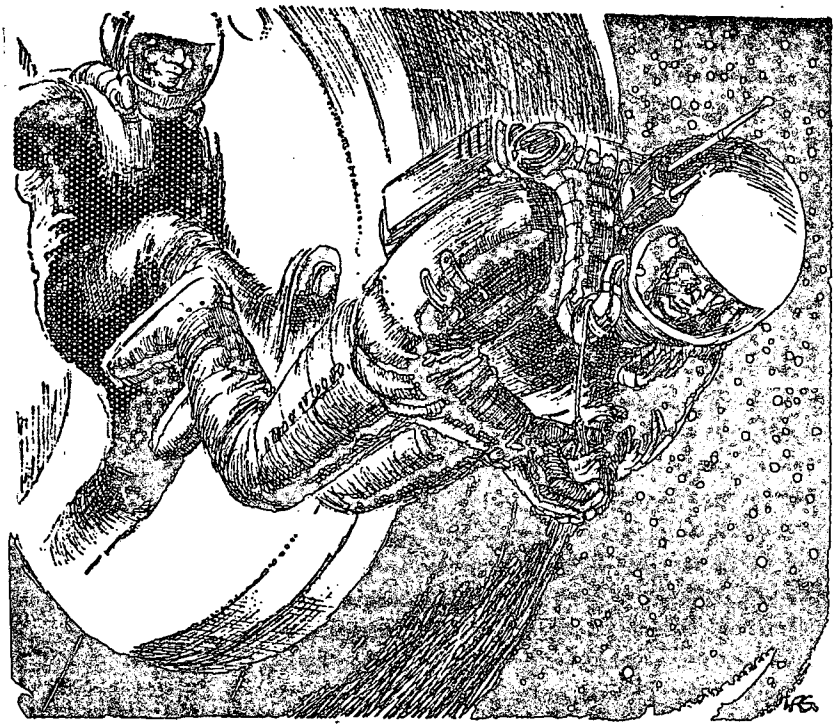

SATELLITE SYSTEM

By H. B. FYFE

Fyfe's quite right... there's nothing like a satellite system for a cold-storage arrangement. Keeps things handy, but out of the way....

Illustrated by Summers

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AVING released the netting of his bunk, George Tremont floated himself out. He ran his tongue around his mouth and grimaced.

"Wonder how long I slept . . . feels like too long," he muttered. "Well, they would have called me."

The "cabin" was a ninety-degree wedge of a cylinder hardly eight feet high. From one end of it its outer arc across to the other was just over ten feet, so that it had been necessary to bevel two corners of the hinged, three-by-seven bunk to clear the sides of the wedge. Lockers flattened the arc behind the bunk.

Tremont maneuvered himself into a vertical position in the eighteen inches between the bunk and a flat surface that cut off the point of the wedge. He stretched out an arm to remove towel and razor from one of the lockers, then carefully folded the bunk upward and hooked it securely in place.

With room to turn now, he swung around and slid open a double door in the flat surface, revealing a shaft three feet square whose center was also the theoretical intersection of his cabin walls. Tremont pulled himself into the shaft. From "up" forward, light leaked through a partly open hatch, and he could hear a murmur of voices as he jackknifed in the opposite direction.

"At least two of them are up there," he grunted.

He wondered which of the other three cabins was occupied, meanwhile pulling himself along by the ladder rungs welded to one corner of the shaft. He reached a slightly wider section aft, which boasted entrances to two air locks, a spacesuit locker, a galley, and a head. He entered the last, noting the murmur of air-conditioning machinery on the other side of the bulkhead.

Tremont hooked a foot under a toehold to maintain his position facing a mirror. He plugged in his razor, turned on the exhauster in the slot below the mirror to keep the clippings out of his eyes, and began to shave. As the beard disappeared, he considered the deals he had come to Centauri to put through.

"A funny business!" he told his image. "Dealing in ideas! Can you really sell a man's thoughts?"

Beginning to work around his chin, he decided that it actually was practical. Ideas, in fact, were almost the only kind of import worth bringing from Sol to Alpha Centauri. Large-scale shipments of necessities were handled by the Federated Governments. To carry even precious or power metals to Earth or to return with any type of manufactured luxury was simply too expensive in money, fuel, effort, and time.

On the other hand, traveling back every five years to buy up plans and licenses for the latest inventions or processes—*that* was profitable enough to provide a good living for many a man in Tremont's business. All he needed were a number of reliable contacts and a good knowledge of the

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needs of the three planets and four satellites colonized in the Centaurian system.

Only three days earlier, Tremont had returned from his most recent trip to the old star, landing from the great interstellar ship on the outer moon of Centauri VII. There he leased this small rocket—the *Annabel,* registered more officially as the AC7-4-525—for his local traveling. It would be another five days before he reached the inhabited moons of Centauri VI.

He stopped next in the galley for a quick breakfast out of tubes, regretting the greater convenience of the starship, then returned the towel and razor to his cabin. He decided that his slightly rumpled shirt and slacks of utilitarian gray would do for another day. About thirty-eight, an inch or two less than six feet and muscularly slim, Tremont had an air of habitual neatness. His dark hair, thinning at the temples, was clipped short and brushed straight back. There were smile wrinkles at the corners of his blue eyes and grooving his lean cheeks.

He closed the cabin doors and pulled himself forward to enter the control room through the partly open hatch. The forward bulkhead offered no more head room than did his own cabin, but there seemed to be more breathing space because this chamber was not quartered. Deck space, however, was at such a premium because of the controls, acceleration couches, and astrogating equipment that the hatch was the largest clear area.

Two men and a girl turned startled eyes upon Tremont as he rose into their view. One of the men, about forty-five but sporting a youngish manner to match his blond crewcut and tanned features, glanced quickly at his wrist watch.

"Am I too early?" demanded Tremont with sudden coldness. "What are you doing with my case there?"

The girl, in her early twenties and carefully pretty with her long black hair neatly netted for space, snatched back a small hand from the steel strongbox that was shaped to fit into an attaché case. The second man, under thirty but thick-waisted in a gray tee-shirt, said in the next breath, "Take him!"

Too late, Tremont saw that the speaker had already braced a foot against the far bulkhead. Then the broad face with its crooked blob of a nose above a ridiculous little mustache shot across the chamber at him. Desperately, Tremont groped for a hold that would help him either to avoid the charge or to pull himself back into the shaft, but he was caught half in and half out.

He met the rush with a fist, but the tangle of bodies immediately became confusing beyond belief as the other pair joined in.

Something cracked across the back of his head, much too hard to have been accidental.

When Tremont began to function again, it took him only a few seconds to realize that life had been going on without him for some little time.

For one thing, the heavy man's

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nosebleed had stopped, and he was tenderly combing blood from his mustache with a fingertip.

For another, they had managed to stuff Tremont into a spacesuit and haul him down the shaft to the air lock. Someone had noosed the thumbs of the gauntlets together and tied the cord to the harness supporting the air tanks.

Tremont twisted his head around to eye the three of them without speaking. He was trying to decide where he had made his mistake.

Bill Braigh, the elderly youth with the crewcut? Ralph Peters, the pilot who had come with the ship? Dorothy Stauber, the trim brunette who had made the trip from Earth on the same starship as Tremont? He could not make up his mind without more to go on.

Then he remembered with a sinking sensation that *all* of them had been clustered about his case of papers and microfilms when he had interrupted them.

"I trust you aren't thinking of making us any trouble, Tremont," drawled Braigh. "Give up the idea; you've been no trouble at all."

"Where do you think this is getting you?" demanded Tremont.

Braigh chuckled.

"Wherever it would have gotten *you*," he said. "Only at less expense."

"Ask him for the combination," growled Peters.

Braigh scrutinized Tremont's expression.

"It would probably take us a while, Ralph," he decided regretfully. "It's simpler to put him outside now and be free to use tools on the box."

Tremont opened his mouth to protest, but Braigh clapped the helmet over his head and screwed it fast.

"You'll never read the code!" yelled Tremont, struggling to break free. "Those papers are no good to you without me!"

Someone slammed him against the bulkhead and held him there with his face to it. He could do nothing with his hands, joined as they were, and very little with his feet. It dawned upon him that they could not hear a word, and he fell silent. Twisting his head to peer out the side curve of his vision band, he caught a glimpse of Peters suiting up.

A few minutes later, they opened the inner hatch of the air lock and shoved Tremont inside. Peters followed, gripping him firmly about the knees from behind.

"Here we go!" grunted Peters, and Tremont realized that he could communicate again, over their suit radios.

"You won't get far, trying to read the code I have those papers written in," he warned. "You'd better talk this over before you make a mistake."

"Ain't no mistake about it," said Peters, pressing toward the outer hatch. "So you chartered the rocket. You felt you oughta go out to see about a heavy dust particle hitting the hull. You fell off an' we never found you."

"How will you explain not going yourself? Or not finding me by instruments?"

Peters clubbed Tremont's foot

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from the tank rack he had hooked with the toe.

"How could I go? Leave the ship without a pilot? An' the screens are for pickin' up meteorites far enough out to mean somethin' at the speeds they travel. So you were too close to register, leastways till it was way too late. You must have suffocated when your air ran out."

Tremont scrabbled about with his feet for some kind of hold. The outer hatch began to open. He could see stars out there.

"Wait!" shouted Tremont.

It was too late. He felt himself shoot forward as if Peters had thrust a foot into the small of his back and shoved. Tremont tried to grab at the edge of the air lock, but it was gone. A puff of air frosted about him, its human bullet.

The stars spun slowly before his eyes. After a moment, the gleaming hull of the *Annabel* swam into his field of view. It was already thirty feet away and the air lock was closing. He caught a glimpse of a space-suited figure with the light behind it.

Then he was looking at the stars again.

The small, distant brilliance of Alpha Centauri made him squint in the split second before the suit's photoelectric cells caused filters to flip down before his eyes. Then it was stars again, and the filters retracted.

"They can't do this!" said Tremont. "*Peters!* Do you hear me? You can't get away with this!"

There was no answer.

The rocket came into view again, farther away. He had to get back somehow. Forgetting the bound position of his hands, he attempted to check his belt equipment. Holding his arms as far as possible from his body was not enough to let him get a look at the harness from within his helmet.

He tugged violently at the cord holding the thumbs of his gauntlets, and thought it gave slightly.

Maybe it just tightened, he thought.

To free his hands, he drew his arms in through the wide armpits of the suit sleeves, built that way to enable the wearer to feed himself, wipe his brow, or adjust clothing or heating units within the suit. He felt more comfortable but that got him nowhere except for the chance to consult his wrist watch.

Set at the lunar time of Centauri VII-4, it told him that when he had gone out of the air lock five minutes before the time had been 17:36. It did not strike Tremont as being a very promising bit of data—warning him merely that when he began to feel the want of air, it would be about 21:30. He longed for a penknife.

"*There's* one thing I'm going to ask about on my next trip to Sol—if I make one!" he muttered. "Has anyone developed a reliable, small *suit* air lock, so you can pass things out from your pockets?"

He thrust his hands once more into the arms of the suit, and felt as

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far along his belt as he could. He did manage to reach the usual position of the standard rocket pistol. The hook was empty.

"Well, that's that!" he groaned. "They didn't forget. I have nothing to maneuver with."

He pondered worriedly. Perhaps the air—if he dared to waste any, it would make a small jet. Slow, but he had all the rest of his life!

He settled down to picking at the cord about his thumbs with the tips of the other fingers in his gauntlets. It seemed possible that he might in time chew it up to the point where it could be snapped.

The stars streamed slowly past his line of vision as he spun through the emptiness. Two or three little bits of the cord chipped off and drifted away. Tremont realized that it was frozen and brittle. He redoubled his efforts. After a few minutes of clumsy clicking of fingertips against thumbs, he strained to pull his hands apart.

The cord parted and his arms jerked out to their full spread with such suddenness that he felt his backbone creak. For a moment, he hung motionless inside his suit, wondering if he had hurt himself.

Recovering, he groped about, checking for his equipment. He discovered that nothing had been left. No knife, no rocket pistol, no line with magnet for securing oneself to a hull.

Well, at least I can reach the valves of the air tanks, he reassured himself.

He watched for the ship, so as to judge his direction. Several minutes passed before he allowed himself to recognize the truth of his situation: he could no longer see the gleam of Alpha Centauri on the hull!

He was aready too far out to dare to waste air. He might give away his last four hours of life just to send himself in the wrong direction.

"How did I get myself into this?" he groaned.

He set himself to thinking back to his meetings with the others. Dorothy Stauber had landed from the same starship after passage from Sol, but he had not become acquainted with her during the trip except to pass the time of day. He seemed to remember that she had turned up in the Customs dome to ask his advice on travel . . .

"Ye-ah!" he growled to himself. "*After* I phoned to lease a rocket. She must have known, but how?"

Someone in the shipping office? Well, why not Peters, the pilot? And then Braigh had come along, pretending to have been on his way back to Centauri VI and hoping to buy a fast passage on a small vessel for business reasons. He had been free and ready with his money, leading Tremont to consider cutting his own expenses on the charter.

It seemed, on the face of it, that the three of them had never met until the *Annabel* lifted.

"But they had, all right!" Tremont told himself. "That was no

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chance, anywhere along the line. I've been very neatly highjacked!"

The girl must have trailed him to make sure they picked up the right man. Braigh had never explained exactly what he was doing on the satellite; he could have arranged for the assignment of the rocket, or perhaps of the pilot, when Tremont called. Then they had gathered around to hitch rides, and had been in control ever since.

Tremont looked at the slowly progressing constellations and cursed himself. He began to have the feeling that there would be no way out of this. They would regret pitching him into space in such an offhand manner, he reminded himself, when they opened his case. It would be too late as far as he was concerned.

Come to think of it, he considered, *that Braigh looks pretty smart, under that idiot-kid pose. He might just break my code, given time. And the parts made up of model photos or drawings he can sell almost as is.*

When he came to think of it, Tremont was surprised that no one had tried the same racket before. He had laid out a fortune for what the three thieves were stealing from him.

He drew in his left arm again and raised the wrist to the neck of his helmet. By looking down his nose, he discovered to his surprise that he had been out nearly an hour. He had wasted more time than he thought in reviewing his earlier encounters with Dorothy aboard the starship and the others at the spaceport.

He raised the water tube to his mouth and sucked in a mouthful. The taste was stale.

I could do with a beer, if this is the way I'm going out, he thought. *They can joke all they want about dying in bed after traveling to the stars; but you could order a beer even if it killed you.*

It gradually dawned upon him that the hazy light he had accepted as being a nebula must be something closer. He watched for it, and discovered after a few moments that it was growing brighter. It continued to do so for half an hour.

"It might be another ship!" he breathed, then began to shout, "Mayday! Mayday!" over his radio.

He kept it up for nearly a quarter of an hour, even after the outline was definitely recognizable as a rocket. He found himself drifting across its course near the bow. It was hard to estimate the distance, but he guessed it to be something like a hundred yards.

Drifting? he asked himself. *It should be going past me like a shooting star! Unless they took exactly the same curve from Centauri VII—*

Then he could read the numbers he feared to see. AC7-4-525. His own ship.

He had gone out of the air lock mainly on a puff of air, with some fumbling help from Peters. That had been enough to send him out of sight of the ship—in space, not necessarily very far—and now he was back, after two hours.

A long, flat orbit in relation to the ship, he told himself, remembering in

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time to avoid speaking aloud that Braigh might be at the ship's radio, *but actually weaving back and forth across the rocket's course, just nipping it at this end.*

He edged a hand inside the suit again and turned off his radio. If he found an answer, it would be fatal to be overheard mumbling about it.

The ship now seemed to be rushing at him, and Tremont deduced that his orbital speed had increased as he approached the focus represented by the *Annabel.* He would doubtless pass near the air lock at about his expulsion speed.

"Here's the chance!" he exulted. "A little air let out to slow down . . . or even just to veer close enough to lay hands on something! You launched me, Peters, but you didn't lose me."

Getting through the airlock should be easy enough. He might be well up the shaft before the others emerged from the control room. In fact, unless Peters were on watch, the air lock operating signal might flash unnoticed on the board.

"And I'll be cracking skulls before they know what's up!" he growled.

It struck him with a flash of ironic amusement that he had not felt half so much hate when believing himself doomed. After two hours of sweating out his helplessness, he had discovered a lively resentment of the vicious callousness with which he had been jettisoned.

He was only about twenty-five yards away now, seemingly circling the ship. Peering closer, he saw that actually he was sweeping in toward it.

Now, be ready with the air tank valve, just in case! he warned himself.

The great fins loomed to his right; the hull blotted most of the sky from his view. It looked as if he would curve down to a spot beside the same air lock from which he had been expelled. It seemed to be still open.

Then he saw the shape of a helmet rise around the curve of the ship. Someone was out on the hull.

Tremont switched on his radio and listened.

The spacesuited figure climbed completely into view. There appeared to be a line running from the belt into the air lock, and the figure carried a long pole of some sort.

"Oh, there you are, Tremont!" came Braigh's voice over the receiver. "I've been waiting for you."

The chuckle that followed made Tremont curse, which in turn provoked a hearty laugh from the other.

"You didn't think I'd forget you?" asked Braigh. "We figured out what happened as soon as we heard you putting out those distress calls. After that, it was just a matter of timing. Have you had an amusing trip?"

"Have you found out you can't make anything of those papers yet?" countered Tremont.

"Oh, the coding? It might take a little time, but we have plenty . . . now, now, Tremont! That kind of abusive language will get you nowhere."

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Tremont had drifted to a point above the other's head, almost within reach. He was kicking out in little motions that betrayed his eagerness to come to grips with Braigh or *something* solid.

"Why, Tremont! I do believe that you thought I came out to bargain with you," chuckled the blond man. "Not at all! I told you that you'd be no trouble. I just came out to finish the job Peters bungled."

Tremont saw the pole jabbing upward at his stomach. Instinctively, he grabbed at the end. Braigh was not disturbed.

"Take it with you, then!" he laughed, letting go his end with a powerful push. "Let me know if you're alive the next time you come around, so I can come out again."

Tremont began to swear at him, then got a grip on himself long enough to snap his radio off.

He had been pulling himself down the pole when Braigh had shoved. That sapped some of the force, but it was still enough to send him spinning out into the void once more.

The ship receded slowly. He saw Braigh return to the air lock and enter. A moment later, that light was cut off, and Tremont began to back off into space as he had the first time.

They know all about it, he realized. *They could leave me any time just by burning a little fuel. Peters wouldn't care about wasting it—I paid for it. Maybe he's just too lazy to calculate the course correction.*

If so, he decided, the pilot was right. Tremont might drift back, but two more hours from now, when he would be at his closest, would be too late. He would be too near the end of his air to use it to make sure of the last few feet.

He looked at the pole in his grip. It was an eight-foot section of aluminum from the cargo racks.

"Maybe . . ." he muttered.

Whirling the pole around by the end, he managed after considerable trial and error, to slow his wild spin enough to keep the ship in view.

The only question then was whether he dared to take the chance; and he really had but one choice. The full orbit would be too long a period.

He estimated as well as he could the direction of his progress, allowed a few degrees which he fondly hoped would curve him in to a closer approach at the meeting point, and hurled the pole into space with all his strength.

After that, there was nothing to do but wait and hope that he had cut his speed enough to bring him to the ship ahead of schedule by a shorter orbit.

Tremont finally gave up looking at his watch when he found himself peeping every three minutes, on the average. The immensity of space was by now instilling in him a psychological chill, and he drew both arms in from their sleeves to hug an illusion of warmth to him. The air pressure in the sleeves gradually overpowered the springs of the joints, and extended them to make a cross.

As far as he could tell from the

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gauges lined in a miniature row along the neckpiece of the suit, his heating system was functioning as designed. The batteries had an excellent chance of lasting longer than he would.

He began to dwell upon thoughts of squeezing Peters in the steel grip of his gauntlets until the pilot's fat face turned purple and his eyes popped. Another promising activity would be to bang Braigh's head against a bulkhead with one hand and Dorothy's with the other.

Wonder if they found the gun in my locker? he mused.

Finally, only a lifetime or two after he hoped to see it, he sighted the ship again. His watch claimed the trip had lasted less than ninety minutes.

He encountered unexpected trouble approaching the hull. Realizing that he was lucky to come close at all by such a guess, he tried to steer himself with brief jets from his air tank, and wound up on the verge of bashing directly into a fin. He avoided that, but had to use more air to spin back for a more gentle contact.

The metal felt like solid Earth to him as he seized the edge of a fin and planted the magnets of his boots firmly on the hull.

It was perhaps twenty minutes later, when Tremont was beginning to worry again about his air supply, that the hatch of the air lock began to open.

Crystals of frost puffed out as the water vapor left the air. Braigh's helmet appeared, then the whole spacesuited figure floated up before the spot where Tremont was watching. The highjacker dropped the magnet of his life line against the hull and started to turn around.

Tremont grabbed the edge of the hatch with one hand, yanked the magnet loose with the other, and kicked Braigh in the right area.

The spacesuited figure shot off, tumbling end over end, into the void. A startled squawk sounded over Tremont's receiver.

"See how *you* like it!" he snarled.

He ignored the begging of the suddenly frightened voice, and dived into the air lock. In seconds, he had the outer hatch shut and was nervously watching the air pressure building up on the gauge.

If they notice at all, they'll think it's Braigh coming back! he exulted.

He made it into the central shaft without meeting anyone. Pulling himself forward in the bulky suit was an awkward task, but well worth it for the expression on Peters' face when Tremont burst through the control-room hatch.

After dealing with the pilot in about two minutes, most of it spent in catching him, Tremont went back along the shaft and found Dorothy in her bunk. Before she could release the netting, he folded the bunk upon her and secured it to the hook. Only then did he allow himself the time to remove his helmet and make free of the ship's air.

"What are you going to do?" demanded the girl, rather shrilly.

Tremont realized that she must have seen the unconscious Peters floating outside in the shaft.

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"You won't like it!" he promised.

"Tremont! I didn't know they'd do anything to you. Can't . . . you and I . . . make some kind of . . . deal?"

Tremont stared at her levelly.

"But I'd have to really sleep sometime," he pointed out gently. "How can I trust you . . . ?"

He was hardly a million miles out from the satellite system of Centauri VI when the Space Patrol ship he had called managed to put a pilot aboard to land the *Annabel* for him on the largest moon.

Tremont returned wearily from helping the man in the air lock—which he did with a practiced efficiency that surprised the pilot—to resume his talk with the patrol-ship captain waiting on the screen.

"We could have done it sooner, you know," said the latter curiously. "Well, now that I see him beside you, perhaps you'll explain your request to delay, and also what those pips trailing you are."

"It's all the same story," said Tremont, and explained his difficulties.

The patrol captain frowned and expressed a wish to lay hands on the highjackers.

"Well, they're due back in"—Tremont consulted his watch—"about two hours. I wanted them near the ends of their orbits as you approached."

"You mean there are three bodies out there?"

"Live ones, in spacesuits," said Tremont. "Experience is a great teacher. As soon as I sighted Braigh coming back, I set up a regular system."

He explained how he had removed all tools from the three spacesuits, added extra tanks, and stuffed the trio into them, either unconscious or at gunpoint.

"Then, having fastened the ankles together and wired the wrists to the thighs so they couldn't move at all, I launched them one at a time with enough pressure in the air lock to give four-hour orbits. That gave me sleeping time."

"And what about them?" asked the captain.

"Oh, at the end of that period, they'd come drifting in at one-hour intervals. Counting all the necessary operations, each of them got thirty minutes actually out of the suit to eat and so on. Then out he'd go while I fished in the next one. They didn't like it, but they weren't so tough one at a time."

"Let's see—" mused the captain. "Every four hours, you'd have to spend . . . why, only two hours processing them. As a result, you kept complete control and came shooting in here with your own satellite system revolving about you."

"And your friends? How have they been passing the time?

"Well, either figuring out how to take me next time," guessed Tremont, "or wishing they were moving in more honest circles!"

THE END

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COMBAT

By MACK REYNOLDS

Illustrated by Schoenherr

An Alien landing on Earth might be readily misled, victimized by a one-sided viewpoint. And then again . . . it might be the Earthmen who were misled. . . .

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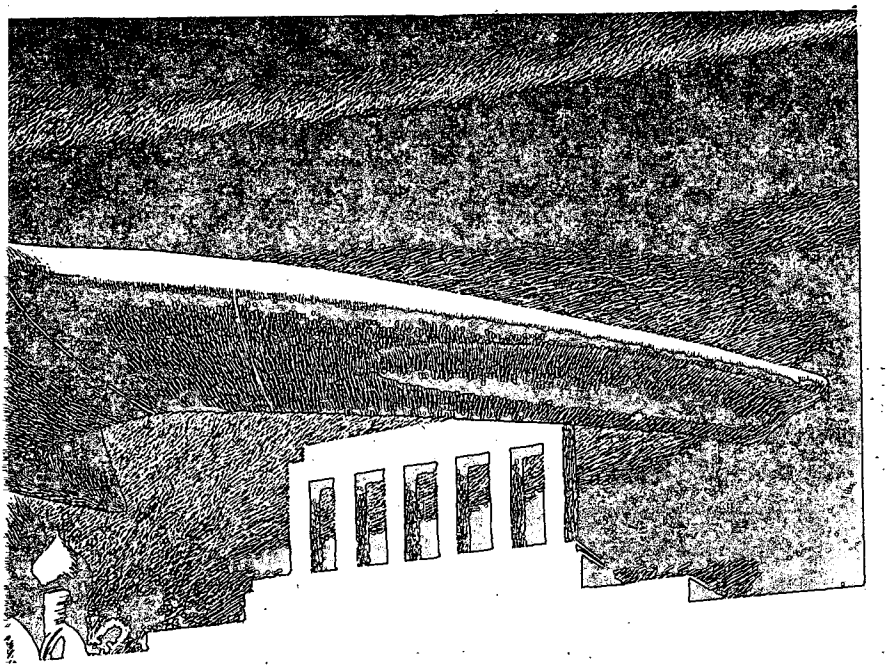

HENRY KURAN answered a nod here and there, a called out greeting from a desk an aisle removed from the one along which he was progressing, finally made the far end of the room. He knocked at the door and pushed his way through before waiting a response.

There were three desks here. He didn't recognize two of the girls who looked up at his entry. One of them began to say something, but then Betty, whose desk dominated the entry to the inner sanctum, grinned a welcome at him and said, "Hank! How was Peru? We've been expecting you."

"Full of Incas," he grinned back. "Incas, Russkies and Chinks. A poor capitalist *conquistador* doesn't have a chance. Is the boss inside?"

"He's waiting for you, Hank. See you later."

Hank said, "Um-m-m," and when the door clicked in response to the button Betty touched, pushed his way into the inner office.

Morton Twombly, chief of the department, came to his feet, shook hands abruptly and motioned the other to a chair.

"How're things in Peru, Henry?"

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His voice didn't express too much real interest.

Hank said, "We were on the phone just a week ago, Mr. Twombly. It's about the same. No, the devil it is. The Chinese have just run in their new People's Car. They look something like our jeep station-wagons did fifteen years ago."

Twombly stirred in irritation. "I've heard about them."

Hank took his handkerchief from his breast pocket and polished his rimless glasses. He said evenly, "They sell for just under two hundred dollars."

"Two hundred dollars?" Twombly twisted his face. "They can't transport them from China for that."

"Here we go again," Hank sighed. "They also can't sell pressure cookers for a dollar apiece, nor cameras with f.2 lenses for five bucks. Not to speak of the fact that the Czechs can't sell shoes for fifty cents a pair and, of course, the Russkies can't sell premium gasoline for five cents a gallon."

Twombly muttered, "They undercut our prices faster than we can vote through new subsidies. Where's it going to end Henry?"

"I don't know. Perhaps we should have thought a lot more about it ten or fifteen years ago when the best men our universities could turn out went into advertising, show business and sales—while the best men the Russkies and Chinese could turn out were going into science and industry." As a man who worked in the field Hank Kuran occasionally got bitter about these things, and didn't mind this opportunity of sounding off at the chief.

Hank added, "The height of achievement over there is to be elected to the Academy of Sciences. Our young people call scientists egg-heads, and their height of achievement is to become a TV singer or a movie star."

Morton Twombly shot his best field man a quick glance. "You sound as though you need a vacation, Henry."

Henry Kuran laughed. "Don't mind me, chief. I got into a hassle with the Hungarians last week and I'm in a bad frame of mind."

Twombly said, "Well, we didn't bring you back to Washington for a trade conference."

"I gathered that from your wire. What *am* I here for?"

Twombly pushed his chair back and came to his feet. It occurred to Hank Kuran that his chief had aged considerably since the forming of this department nearly ten years ago. The thought went through his mind, *a general in the cold war. A general who's been in action for a decade, has never won more than a skirmish and is currently in full retreat.*

Morton Twombly said, "I'm not sure I know. Come along."

They left the office by a back door and Hank was in unknown territory. Silently his chief led him through busy corridors, each one identical to the last, each sterile and cold in spite of the bustling. They came to a marine guarded door, were passed

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through, once again obviously expected.

The inner office contained but one desk occupied by a youthfully brisk army major. He gave Hank a one-two of the eyes and said, "Mr. Hennessey is expecting you, sir. This is Mr. Kuran?"

"That's correct," Twombly said. "I won't be needed." He turned to Hank Kuran. "I'll see you later, Henry." He shook hands.

Hank frowned at him. "You sound as though I'm being sent off to Siberia, or something."

The major looked up sharply, "What was that?"

Twombly made a motion with his hand, negatively. "Nothing. A joke. I'll see you later, Henry." He turned and left.

The major opened another door and ushered Hank into a room two or three times the size of Twombly's office. Hank formed a silent whistle and then suddenly knew where he was. This was the sanctum sanctorum of Sheridan Hennessey. Sheridan Hennessey, right arm, hatchetman, *alter ego,* one man brain trust—of two presidents in succession.

And there he was, seated in a heavy armchair. Hank had known of his illness, that the other had only recently risen from his hospital bed and against doctor's orders. But somehow he hadn't expected to see him this wasted. TV and newsreel cameramen had been kind.

However, the waste had not as yet extended to either eyes or voice. Sheridan Hennessey bit out, "That'll be all, Roy," and the major left them.

"Sit down," Hennessey said. "You're Henry Kuran. That's not a Russian name is it?"

Hank found a chair. "It was Kuranchov. My father Americanized it when he was married." He added, "About once every six months some Department of Justice or C.I.A. joker runs into the fact that my name was originally Russian and I'm investigated all over again."

Hennessey said, "But your Russian is perfect?"

"Yes, sir. My mother was English-Irish, but we lived in a community with quite a few Russian born emigrants. I learned the language."

"Good, Mr. Kuran, how would you like to die for your country?"

Hank Kuran looked at him for a long moment. He said slowly, "I'm thirty-two years old, healthy and reasonably adjusted and happy. I'd hate it."

The sick man snorted. "That's exactly the right answer. I don't trust heroes. Now, how much have you heard about the extraterrestrials?"

"I beg your pardon?"

"You haven't heard the news broadcasts the past couple of days? How the devil could you have missed them?" Hennessey was scowling sourly at him.

Hank Kuran didn't know what the other was talking about. "Two days ago I was in the town of Machu Picchu in the Andes trying to peddle some mining equipment to the Peru-

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vians. Peddle it, hell. I was practically trying to give it away, but it was still even-steven that the Hungarians would undersell me. Then I got a hurry-up wire from Morton Twombly to return to Washington soonest. I flew here in an Air Force jet. I haven't heard any news for two days or more."

"I'll have the major get you all the material we have to date and you can read it on the plane to England."

"Plane to England?" Hank said blankly. "Look, I'm in the Department of Economic Development of Neutral Nations, specializing in South America. What would I be doing in England?" He had an uneasy feeling of being crowded, and a suspicion that this was far from the first time Sheridan Hennessey had ridden roughshod over subordinates.

"First step on the way to Moscow," Hennessey snapped. "The major will give you details later. Let me brief you. The extraterrestrials landed a couple of days ago on Red Square in some sort of spaceship. Our Russkie friends clamped down a censorship on news. No photos at all as yet and all news releases have come from Tass."

Hank Kuran was bug-eying him.

Hennessey said, "I know. Most of the time I don't believe it myself. The extraterrestrials represent what the Russkies are calling a Galactic Confederation. So far as we can figure out, there is some sort of league, United Planets, or whatever you want to call it, of other star systems which have achieved a certain level of scientific development."

"Well . . . well, why haven't they shown up before?"

"Possibly they have, through the ages. If so, they kept their presence secret, checked on our development and left." Hennessey snorted his indignation. "See here, Kuran, I have no details. All of our information comes from Tass, and you can imagine how inadequate that is. Now shut up while I tell you what little I do know."

Henry Kuran settled back into his chair, feeling limp. He'd had too many curves thrown at him in the past few minutes to assimilate.

"They evidently keep hands off until a planet develops interplanetary exploration and atomic power. And, of course, during the past few years our Russkie pals have not only set up a base on the Moon but have sent off their various expeditions to Venus and Mars."

"None of them made it," Hank said.

"Evidently they didn't have to. At any rate, the plenipotentiaries from the Galactic Confederation have arrived."

"Wanting what, sir?" Hank said.

"Wanting nothing but to help," Hennessey said. "Stop interrupting. Our time is limited. You're going to have to be on a jet for London in half an hour."

He noticed Hank Kuran's expression, and shook his head. "No, it's not farfetched. These other intelligent life forms must be familiar with

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what it takes to progress to the point of interplanetary travel. It takes species aggressiveness—besides intelligence. And they must have sense enough not to want the wrong kind of aggressiveness exploding into the stars. They don't want an equivalent of Attila bursting over the borders of the Roman Empire. They want to channel us, and they're willing to help, to direct our comparatively new science into paths that won't conflict with them. They want to bring us peacefully into their society of advanced life forms."

Sheridan Hennessey allowed himself a rueful grimace. "That makes quite a speech, doesn't it? At any rate, that's the situation."

"Well, where do I come into this? I'm afraid I'm on the bewildered side."

"Yes. Well, damn it, they've landed in Moscow. They've evidently assumed the Soviet complex—the Soviet Union, China and the satellites—are the world's dominant power. Our conflicts, our controversies, are probably of little, if any, interest to them. Inadvertently, they've put a weapon in the hands of the Soviets that could well end this cold war we've been waging for more than twenty-five years now."

The president's right-hand man looked off into a corner of the room, unseeingly. "For more than a decade it's been a bloodless combat that we've been waging against the Russkies. The military machines, equally capable of complete destruction of the other, have been stymied. Finally it's boiled down to an attempt to influence the neutrals, India, Africa, South America, to attempt to bring them into one camp or the other. Thus far, we've been able to contain them in spite of their recent successes. But given the prestige of being selected the dominant world power by the extraterrestrials and in possession of the science and industrial know-how from the stars, they'll have won the cold war over night."

His old eyes flared. "You want to know where you come in, eh? Fine. Your job is to get to these Galactic Confederation emissaries and put a bug in their bonnet. Get over to them that there's more than one major viewpoint on this planet. Get them to investigate our side of the matter."

"Get to them how? If the Russkies—"

Hennessey was tired. The flash of spirit was fading. He lifted a thin hand. "One of my assistants is crossing the Atlantic with you. He'll give you the details."

"But why *me*? I'm strictly a—"

"You're an unknown in Europe. Never connected with espionage. You speak Russian like a native. Morton Twombly says you're his best man. Your records show that you can think on your feet, and that's what we need above all."

Hank Kuran said flatly, "You might have asked for volunteers."

"We did. You, you and you. The old army game," Hennessey said wearily. "Mr. Kuran, we're in the clutch. We can lose, forever—right

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now. Right in the next month or so. Consider yourself a soldier being thrown into the most important engagement the world has ever seen—combating the growth of the Soviets. We can't afford such luxuries as asking for volunteers. Now do you get it?"

Hank Kuran could feel impotent anger rising inside him. He was off balance. "I get it, but I don't like it."

"None of us do," Sheridan Hennessey said sourly. "Do you think any of us do?" He must have pressed a button.

From behind them the major's voice said briskly, "Will you come this way, Mr. Kuran?"

In the limousine, on the way out to the airport, the bright, impossibly cleanly shaven C.I.A. man said, "You've never been behind the Iron Curtain before, have you Kuran?"

"No," Hank said. "I thought that term was passé. Look, aren't we even going to my hotel for my things?"

The second C.I.A. man, the older one, said, "All your gear will be waiting for you in London. They'll be sure there's nothing in it to tip off the KGB if they go through your bags."

The younger one said, "We're not sure, things are moving fast, but we suspect that that term, Iron Curtain, applies again."

"Then how am I going to get in?" Hank said irritably. "I've had no background for this cloak and dagger stuff."

The older C.I.A. man said, "We understand the KGB has increased security measures but they haven't cut out all travel on the part of non-Communists."

The other one said, "Probably because the Russkies don't want to tip off the spacemen that they're being isolated from the western countries. It would be too conspicuous if suddenly all western travelers disappeared."

They were passing over the Potomac, to the right and below them Hank Kuran could make out the twin Pentagons, symbols of a military that had at long last by its very efficiency eliminated itself. War had finally progressed to the point where even a minor nation, such as Cuba or Portugal, could completely destroy the whole planet. Eliminated wasn't quite the word. In spite of their sterility, the military machines still claimed their million masses of men, still drained a third of the products of the world's industry.

One of the C.I.A. men was saying urgently, "So we're going to send you in as a tourist. As inconspicuous a tourist as we can make you. For fifteen years the Russkies have boomed their tourist trade—all for propaganda, of course. Now they're in no position to turn this tourist flood off. If the aliens got wind of it, they'd smell a rat."

Hank Kuran brought his attention back to them. "All right. So you get me to Moscow as a tourist. What do I do then? I keep telling you jokers that I don't know a thing

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about espionage. I don't know a secret code from judo."

"That's one reason the chief picked you. Not only do the Russkies have nothing on you in their files—neither do our own people. You're safe from betrayal. There are exactly six people who know your mission and only one of them is in Moscow."

"Who's he?"

The C.I.A. man shook his head. "You'll never meet him. But he's making the arrangements for you to contact the underground."

Hank Kuran turned in his seat. "What underground? In Moscow?"

The bright, pink faced C.I.A. man chuckled and began to say something but the older one cut him off. "Let me, Jimmy." He continued to Hank. "Actually, we don't know nearly as much as we should about it, but a Soviet underground is there and getting stronger. You've heard of the *stilyagi* and the *mitrofanushka?*"

Hank nodded. "Moscow's equivalent to the juvenile delinquents, or the Teddy Boys, as the British call them."

"Not only in Moscow, they're everywhere in urban Russia. At any rate, our underground friends operate within the *stilyagi,* the so-called jet-set, using them as protective coloring."

"This is new to me," Hank said. "And I don't quite get it."

"It's clever enough. Suppose you're out late some night on an underground job and the police pick you up. They find out you're a juvenile delinquent, figure you've been out getting drunk, and toss you into jail for a week. It's better than winding up in front of a firing squad as a counterrevolutionary, or a Trotskite, or whatever they're currently calling anybody they shoot."

The chauffeur rapped on the glass that divided their seat from his, and motioned ahead.

"Here's the airport," Jimmy said. "We'll drive right over to the plane. Hide your face with your hat, just for luck."

"Wait a minute, now," Hank said. "Listen, how do I contact these beat generation characters?"

"You don't. They contact you."

"How."

"That's up to them. Maybe they won't at all; they're plenty careful." Jimmy snorted without humor. "It must be getting to be an instinct with Russians by this time. Nihilists, Anarchists, Mensheviks, Bolsheviks, now anti-Communists. Survival of the fittest. By this time the Russian underground must consist of members that have bred true as revolutionists. There've been Russian undergrounds for twenty generations."

"Hardly long enough to affect genetics," the older one said wryly.

Hank said, "Let's stop being witty. I still haven't a clue as to how Sheridan Hennessey expects me to get to these Galactic Confederation people—or things, or whatever you call them."

"They evidently are humanoid," Jimmy said. "Look more or less human. And stop worrying, we've got

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several hours to explain things while we cross the Atlantic. You don't step into character until you enter the offices of Progressive Tours, in London."

The door of Progressive Tours, Ltd. 100 Rochester Row, was invitingly open. Hank Kuran entered, looked around the small room. He inwardly winced at the appearance of the girl behind the counter. What was it about Commies outside their own countries that they drew such crackpots into their camp? Heavy lenses, horn rimmed to make them more conspicuous, wild hair, mawkish tweeds, and dirty fingernails to top it off.

She said, "What can I do for you, Comrade?"

"Not *Comrade*," Hank said mildly. "I'm an American."

"What did you want?" she said coolly.

Hank indicated the travel folder he was carrying. "I'd like to take this tour to Leningrad and Moscow. I've been reading propaganda for and against Russia as long as I've been able to read and I've finally decided I want to see for myself. Can I get the tour that leaves tomorrow?"

She became as businesslike as was within her ability. "There is no country in the world as easy to visit as the Soviet Union, Mr—"

"Stevenson," Hank Kuran said. "Henry Stevenson."

"Stevenson. Fill out these two forms, leave your passport and two photos and we'll have everything ready in the morning. The *Baltika* leaves at twelve. The visa will cost ten shillings. What class do you wish to travel?"

"The cheapest." *And least conspicuous,* Hank added under his breath.

"Third class comes to fifty-five guineas. The tour lasts eighteen days including the time it takes to get to Leningrad. You have ten days in Russia."

"I know, I read the folder. Are there any other Americans on the tour?"

A voice behind him said, "At least one other."

Hank turned. She was somewhere in her late twenties, he estimated. And if her clothes, voice and appearance were any criterion he'd put her in the middle-middle class with a bachelor's degree in something or other, unmarried and with the aggressiveness he didn't like in American girls after living the better part of eight years in Latin countries.

On top of that she was one of the prettiest girls he had ever seen, in a quick, red headed, almost puckish sort of way.

Hank tried to keep from displaying his admiration too openly. "American?" he said.

"That's right." She took in his five-foot ten, his not quite ruffled hair, his worried eyes behind their rimless lenses, darkish tinted for the Peruvian sun. She evidently gave him up as not worth the effort and turned to the fright behind the counter.

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"I came to pick up my tickets."

"Oh, yes, Miss . . ."

"Moore."

The fright fiddled with the papers on an untidy heap before her. "Oh, yes. Miss Charity Moore."

"Charity?" Hank said.

She turned to him. "Do you mind? I have two sisters named Honor and Hope. My people were Seventh Day Adventists. It wasn't my fault." Her voice was pleasant—but nature had granted that; it wasn't particularly friendly—through her own inclinations.

Hank cleared his throat and went back to his forms. The visa questionnaire was in both Russian and English. The first line wanted, *Surname, first name and patronymic.*

To get the conversation going again, Hank said, "What does patronymic mean?"

Charity Moore looked up from her own business and said, less antagonism in her voice, "That's the name you inherited from your father."

"Of course, thanks." He went back to his forms. Under *what type of work do you do,* Hank wrote, *Capitalist in a small sort of way. Auto Agency owner.*

He took the forms back to the counter with his passport. Charity Moore was putting her tickets, suitcase labels and a sheaf of tour instructions into her pocketbook.

Hank said, "Look, we're going to be on a tour together, what do you say to a drink?"

She considered that, prettily, "Well . . . well, of course. Why not?"

Hank said to the fright, "There wouldn't be a nice bar around would there?"

"Down the street three blocks and to your left is Dirty Dick's." She added scornfully, "All the tourists go there."

"Then we shouldn't make an exception," Hank said. "Miss Moore, my arm."

On the way over she said, "Are you excited about going to the Soviet Union."

"I wouldn't say excited. Curious, though."

"You don't sound very sympathetic to them."

"To Russia?" Hank said. "Why should I be? Personally, I believe in democracy."

"So do I," she said, her voice clipped. "I think we ought to try it some day."

"Come again?"

"So far as I can see, we pay lip service to democracy, that's about all."

Hank grinned inwardly. He'd already figured that during this tour he'd be thrown into contact with characters running in shade from gentle pink to flaming red. His position demanded that he remain inconspicuous, as *average* an American tourist as possible. Flaring political arguments weren't going ot help this, but, on the other hand to avoid them entirely would be apt to make him more conspicuous than ever.

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"How do you mean?" he said now.

"We have two political parties in our country without an iota of difference between them. Every four years they present candidates and give us a choice. What difference does it make which one of the two we choose if they both stand for the same thing? This is democracy?"

Hank said mildly, "Well, it's better than sticking up just one candidate and saying, which one of this one do you choose? Look, let's steer clear of politics and religion, eh? Otherwise this'll never turn out to be a beautiful friendship."

Charity Moore's face portrayed resignation.

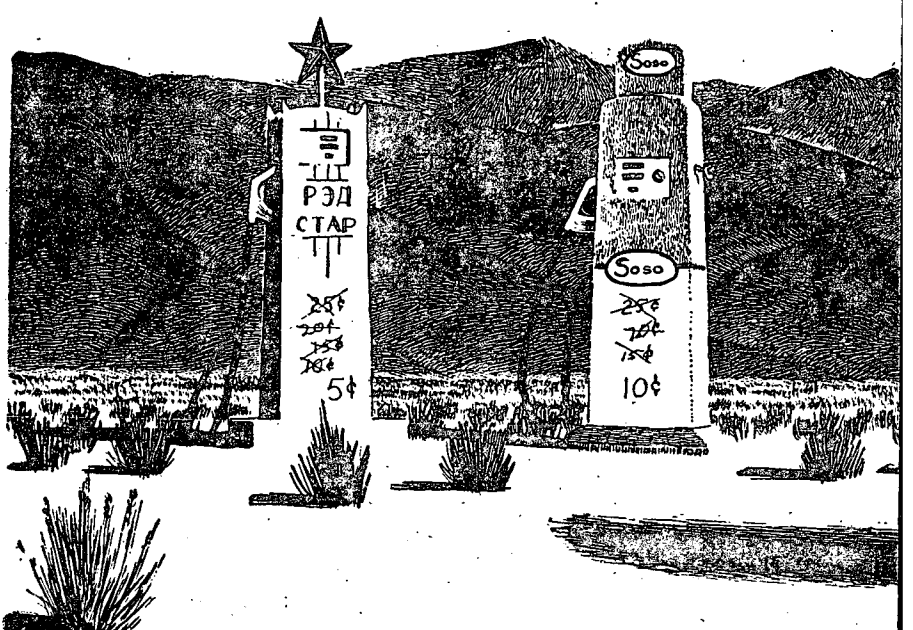
Hank said, "I'm Hank, what do they call you besides Charity?"

"Everybody but my parents call me Chair. You spell it C-H-A-R but pronounce it like Chair, like you sit in."

"That's better," Hank said. "Let's see. There it is, Dirty Dick's. Crummy looking joint. You want to go in?"

"Yes," Char said. "I've read about it. An old coaching house. One of the oldest pubs in London. Dickens wrote a poem about it."

The pub's bar extended along the right wall, as they entered. To the left was a sandwich counter with a dozen or so stools. It was too early to eat, they stood at the ancient bar



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and Hank said to her, "Ale?" and when she nodded, to the bartender, "Two Worthingtons."

While they were being drawn, Hank turned back to the girl, noticing all over again how impossibly pretty she was. It was disconcerting. He said, "How come Russia? You'd look more in place on the beach in Biarritz or the Lido."

Char said, "Ever since I was about ten years of age I've been reading about the Russian people starving to death and having to work six months before making enough money to buy a pair of shoes. So I've decided to see how starving, barefooted people managed to build the largest industrial nation in the world."

"Here we go again," Hank said, taking up his glass. He toasted her silently before saying, "The United States is still the largest single industrial nation in the world."

"Perhaps as late as 1965, but not today," she said definitely.

"Russia, plus the satellites and China has a gross national product greater than the free world's but no single nation produces more than the United States. What are you laughing at?"

"I love the way the West plasters itself so nicely with high flown labels. The *free world*. Saudi Arabia, Ethiopia, Pakistan, South Africa—just what is your definition of *free?*"

Hank had her placed now. A college radical. One of the tens of thousands who discover, usually somewhere along in the sophmore year, that all is not perfect in the land of their birth and begin looking around for answers. Ten to one she wasn't a Commie and would probably never become one—but meanwhile she got a certain amount of kicks trying to upset ideological applecarts.

For the sake of staying in character, Hank said mildly, "Look here, are you a Communist?"

She banged her glass down on the bar with enough force that the bartender looked over worriedly. "Did it ever occur to you that even though the Soviet Union might be wrong—if it is wrong—that doesn't mean that the United States is right? You remind me of that . . . that *politician,* whatever his name was, when I was a girl. Anybody who disagreed with him was automatically a Communist."

"McCarthy," Hank said. "I'm sorry, so you're not a Communist."

She took up her glass again, still in a huff. "I didn't say I wasn't. That's my business."

The turboelectric ship *Baltika* turned out to be the pride of the U.S.S.R. Baltic State Steamship Company. In fact, she turned out to be the whole fleet. Like the rest of the world, the Soviet complex had taken to the air so far as passenger travel was concerned and already the *Baltika* was a left-over from yesteryear. For some reason the C.I.A. thought there might be less observation on the part of the KGB if Hank approached Moscow indirectly, that is by sea and from Leningrad. It was going to take an extra four or five

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days, but, if he got through, the squandered time would have been worth it.

An English speaking steward took up Hank's bag at the gangplank and hustled him through to his quarters. His cabin was forward and four flights down into the bowels of the ship. There were four berths in all, two of them already had bags on them. Hank put his hand in his pocket for a shilling.

The steward grinned and said, "No tipping. This is a Soviet ship."

Hank looked after him.

A newcomer entered the cabin, still drying his hands on a towel. "Greetings," he said. "Evidently we're fellow passengers for the duration." He hung the towel on a rack, reached out a hand. "Rodriquez," he said. "You can call me Paco, if you want. Did you ever meet an Argentine that wasn't named Paco?"

Hank shook the hand. "I don't know if I ever met an Argentine before. You speak English well."

"Harvard," Paco said. He stretched widely. "Did you spot those Russian girls in the crew? Blond, every one blond." He grinned. "Not much time to operate with them—but enough."

A voice behind them, heavy with British accent said, "Good afternoon, gentlemen."

He was as ebony as a negro can get and as nattily dressed as only Savile Row can turn out a man. He said, "My name is Loo Motlamelle." He looked at them expressionlessly for a moment.

Paco put out his hand briskly for a shake. "Rodriquez," he said. "Call me Paco. I suppose we're all Moscow bound."

Loo Motlamelle seemed relieved at his acceptance, clasped Paco's hand, then Hank's.

Hank shook his head as the three of them began to unpack to the extent it was desirable for the short trip. "The classless society. I wonder what First Class cabins look like. Here we are, jammed three in a telephone booth sized room."

Paco chuckled, "My friend, you don't know the half of it. There are *five* classes on this ship. Needless to say, this is Tourist B, the last."

"And we'll probably be fed borsht and black bread the whole trip," Hank growled.

Loo Motlamelle said mildly, "I hear the food is very good."

Paco stood up from his luggage, put his hands on his hips, "Gentlemen, do you realize there is no lock on the door of this cabin?"

"The crime rate is said to be negligible in the Soviet countries," Loo said.

Paco put up his hands in despair. "That isn't the point. Suppose one of us wishes to bring a lady friend into the cabin for . . . a drink. How can he lock the door so as not to be interrupted?"

Hank was chuckling. "What did you take this trip for, Paco? An investigation into the mores of the Soviets—female flavor?"

Paco went back to his bag. "Actually, I suppose I am one of many.

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Going to the new world to see whether or not it is worth switching alliances from the old."

A distant finger of cold traced designs in Henry Kuran's belly. He had never heard the United States referred to as the Old World before. It had a strange, disturbing quality.

Loo, who was now reclined on his bunk, said, "That's approximately the same reason I visit the Soviet Union."

Hank said quietly, "Who's sending you, Paco? Or are you on your own?"

"No, my North American friend. My lips are sealed but I represent a rather influencial group. All is not jest, even though I find life the easier if one laughs often and with joy."

Hank closed his bag and slid it under his bunk. "Well, you should have had this influencial group pony up a little more money so you could have gone deluxe class."

Paco looked at him strangely. "That is the point. We are not interested in a red-carpet tour during which the very best would be trotted out for propaganda purposes. I choose to see the New World as humbly as is possible."

"And me," Loo said. "We evidently are in much the same position."

Hank brought himself into character. "Well, lesson number one. Did you notice the teeth in that steward's face? Steel. Bright, gleaming steel, instead of gold."

Loo shrugged hugely. "This is the day of science. Iron rusts, it's true, but I assume that the Soviet dentists utilize some method of preventing corrosion."

"Otherwise," Paco murmured reasonably, "I imagine the Russians expectorate a good deal of rusty spittal."

"I don't know why I keep getting into these arguments," Hank said. "I'm just going for a look-see myself. But frankly, I don't trust a Russian any farther than I can throw one."

"How many Russians have you met?" Loo said mildly. "Or are your opinions formed solely by what you have read in American publications?"

Hank frowned at him. "You seem to be a little on the anti-American side."

"I'm not," Loo said. "But not pro-American either. I find much that is ridiculous in the propaganda of both the Soviets and the West."

"Gentlemen," Paco said, "the conversation is fascinating, but I must leave you. The ladies, crowding the decks above, know not that my presence graces this ship. It shall be necessary that I enlighten them. *Adios amigos!*"

The *Baltika* displaced eight thousand four hundred ninety-six tons and had accommodations for three hundred thirty passengers. Of these, Hank Kuran estimated, approximately half were Scandinavians or British being transported between London, Copenhagen, Stockholm and Helsinki

(*Continued on page* 103)

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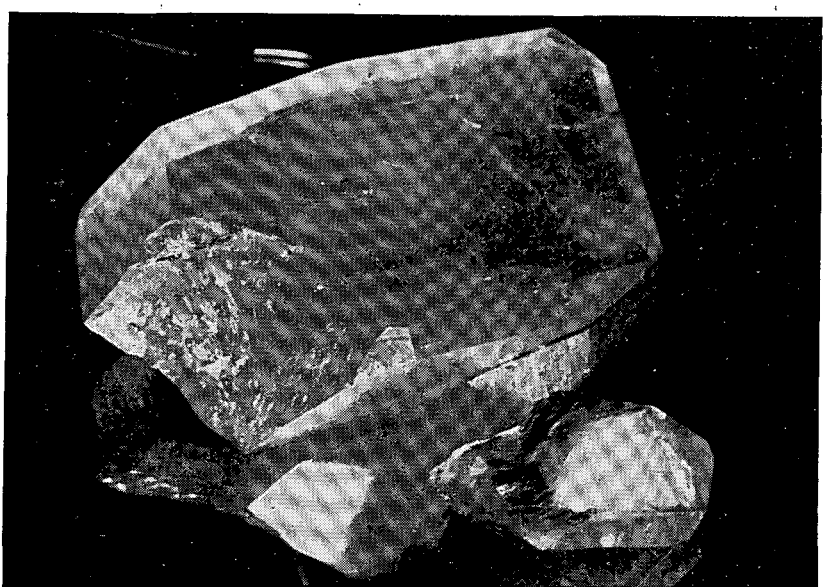

Copper sulfate crystal, deliberately broken, with chip beside it. Photographed on a black ceramic tile.

THE SELF-REPAIRING ROBOT

By JOHN W. CAMPBELL

The self-repairing robot must fall somewhere halfway between a simple inorganic system, and a true living organism. The more you study what crystals do *... the more difficult it becomes to say "Here Life Begins!"*

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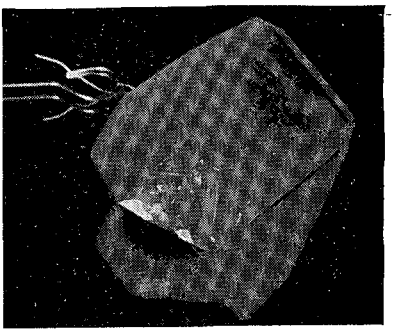
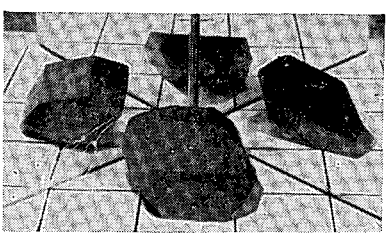


Copper sulfate crystal after three days of healing in the saturated $CuSO_4$ solution. Note that crystalline facets have started to fill in the wound.



The healed copper sulfate crystal . . . and the chip. The chip, too, was put in the growth solution, and healed to a complete crystal.

SOONER or later, we'll have to perfect a system for producing self-repairing machines; surely the self-repairing robot is a standard ideal in science fiction. Perhaps the first step is to define just what it is we mean by a self-repairing entity, to get some idea of just what that goal we're striving for actually means.

Of course, not all robots are the conventional tin-man type; probably the simplest of all present household robots is the little contraption that lives just inside cabinet doors. It reaches out about half an inch, takes hold of the cabinet door, pulls it shut and then holds it there. It's essentially a static machine—just a permanent magnet—but it does perform a dynamic function.

Most of the advances being made today in the direction of real, high-order robots—the self-directing thinking machine type—are being made in the area of solid state physics—in an area where the working units are not man-shaped parts such as gears, shafts and wires, but atoms and molecules. The function of intelligence seems to be very intimately, and probably inherently, associated with complexity—the interaction of billions of decision-making units. If robot intelligence is ever to be achieved, it will involve some practicable method of producing billions of decision-making units at low cost, in minute volume, with high speed, and immense reliability.

Reliability is, actually, the overwhelmingly critical problem. If we had a system that produced only ten per cent functional units, and ninety per cent duds, it would still be fine . . . if those ten per cent functional units could be absolutely guaranteed to *keep on* working. It would mean that a simple test now would make certain that the unit would be functioning at all later times; on that

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basis you can steadily accumulate functioning units, and nothing but functional units. The great problem in reliability in a complex system is this: if a given component has a reliability such that it will show only one failure in one million operations, then if one million of those units are coupled together, there is only a fifty-fifty chance that the system will work. If ten billion are coupled—and there are ten billion neurones in a human brain—there would be only one chance in ten million that it would work at all!

No device whose components are at the gross mechanical level can achieve the required level of reliability; soldered joints don't approach that level, for instance, so that no wired computer could achieve intelligence. Certainly no electromechanical relay approaches the thousand billion operations level of reliability essential for an intelligence-system structural unit.

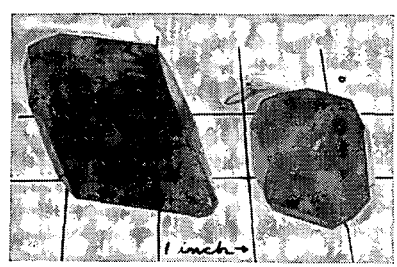
Currently, work is being done in growing complete electronic circuits as part of modified single crystals. The units are not manufactured; they're grown. The operational parts of the units are at the submolecular level, where the concepts of friction, wear, abrasion, et cetera, have no meaning.*

*Credit where credit is due department: Robert A. Heinlein, in his story "Universe" in the May 1941 Astounding Science Fiction, referred to "submolar mechanics" as the technique used in producing the control systems of the spaceship that continued to function for over four thousand years. He specifically made the point that submolar systems would have inherent in them the requisite level of reliability.

These crystals are, of course, the silicon and germanium crystals that first came under intense investigation with the development at Bell Laboratories, of the transistor.

The self-repairing robot isn't with us yet, by a long way, at the man-made level. But there are plenty of self-repairing robots already available for home-grown studies—and the term home-grown is literally exact. They cannot be *built* at home, but they can, very easily, be *grown* at home. Quite ordinary crystals, such as copper sulfate, alum, potassium dichromate . . . these are true, self-repairing, and self-constructing robots.

The essential requirements before a robot can be self-repairing can be laid down, even if we can't state how those requirements can be fulfilled. To be self-repairing, an entity must (1) have some sort of awareness . . . understanding . . . memory



The chip photographed in the intersection of two mirrors at right angles, to show all sides. A white ceramic tile, ruled with India ink and sprayed with a lacquer is a highly useful tool in this work.

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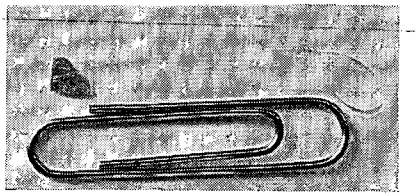
. . . conception . . . call it what you will . . . of What Should Be; and (2) a simultaneous awareness, or what have you, of What Is; and (3) be able to do something to make What Is change to align with What Should Be.

The terms are, obviously, anthropomorphic—subjective. Highly objectionable in any scientific discussion.

Too bad, too . . . they happen to fit perfectly. Call What Should Be the Ideal, the Pattern, the Original Instruction—it still comes out having the meaning What Should Be, because the self-repairing robot must not only have a pattern, but be driven to achieve the pattern—motivated, in essence. The essence of the self-repairing function is to change the improper state to the intended state; both terms inevitably imply a bias, a choice and a motivation.

An ordinary machine has no tendency toward self-repair, because any condition it is in, is, so far as it's concerned, the appropriate and accepted state of affairs. To be self-repairing, the entity must, in essence, have a sense of discontent which is stimulated whenever What Is does not match the Ideal. And that, of course, requires that there be an Ideal of which the entity is aware in some fashion. A living animal heals a wound because the wound is not What Should Be; the organism is stimulated to repair it.

The self-repairing robot must have a similar sense of discontent with disrepair.



Nickel sulfate hexahydrate — $NiSO_4.6\ H_2O$ — seed crystal cemented with polystyrene cement *to a piece of eight-pound test* monofilament nylon fishline.

Now such ordinary crystals as I mentioned show precisely such characteristics. Some ten months ago, I started studying some of the things crystals will do, strictly on a home-experiment level; the more I've worked with those strictly inorganic crystals, the less I am able to give any objective statement of the difference between living and nonliving entities. None of the usual statements that we get in high-school biology really work —and the more I study crystals, and study what biochemists are doing, the closer the two subjects seem to approach each other.

Usually, it's said that nonliving things cannot grow, reproduce, or heal themselves. Crystals grow, of course, but, says the old biology definition of "living," they can grow only in a medium of their own kind, without transforming that medium into their substance.

Well . . . a plant, say a yeast cell, can't grow in a medium that contains no carbon. And it can't grow in a medium that does not supply it with chemical energy to drive its biochem-

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ical processes. A green plant, which can trap solar energy, still needs an environment which already contains energy to operate its process—in this case, light energy is part of its environment.

But if you add an iodide solution to cupric sulfate, or any soluble cupric salt, crystals of cu*prous* iodide form. The cupric ions have been altered by the forces of the crystallization process to yield cuprous ions, on which the crystals feed.

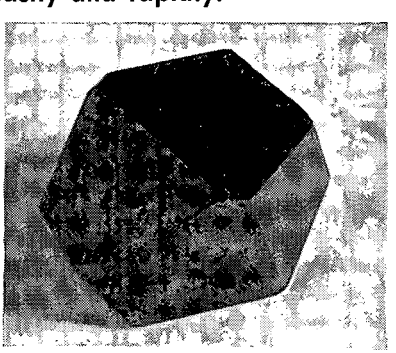
Take some aluminum sulfate crystals, and some potassium sulfate crystals. Put them in water. In the course of a few days, all of this "food" will have been "digested" and transformed into a new material—alum.

Because crystals are self-repairing, crystals can readily be reproduced by simple fission, just as primitive organisms can. Cut a hydra in half, and you can get it to grow into two hydra. In the photographs on pages 83 and 84 you see reproduction-by-fission in the case of a copper sulfate crystal; the crystal was broken, and the crystalline forces repaired the large crystal. The crystal in the junction of the two 90° mirrors is the chip from the large crystal, which repaired itself, and grew into a daughter crystal.

Of course, crystals normally reproduce by seeding. It's been held that living things can start only from living things, while merely allowing a solution to evaporate spontaneously generates crystals.

There's plenty of reason to question that one.

The seed grown up — six days later. The scale of this shot is about two-thirds that of the preceding — nickel sulfate grows easily and rapidly.



Some years ago, physical chemists at an American university wanted to study solid glycerine. Now the handbooks say that glycerine freezes at about room temperature—68° F.—but that means pure, water-free glycerine. Since glycerine is rather frantically hygro scopic, water-free glycerine is not a normal occurrence, and the water naturally lowers the freezing point of the solution.

The chemists purified their glycerine, dehydrated it thoroughly, and chilled it. It didn't freeze; it just got viscous. They jolted it, stirred it, and did all the things crystallographers do in inducing reluctant substances to crystallize. They cooled it in liquid air; it turned to a glassy, but still amorphous, solid.

Finally they wrote to the German university where the original published material on glycerine, solid state,

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had been written. What was the trick of freezing the darned stuff?

The German replied that he could not understand their difficulty; one simply chilled it, and it froze. Perhaps the Americans didn't have pure glycerine? Herr Doktor was sending a sample along. . . .

And since that sample arrived and was opened, nobody has been able to keep glycerine from freezing in that laboratory. It no longer goes into a glassy state even if they want it to.

Crystals, apparently, have seeds—microscopic spores that are far more subtly submicroscopic than the smallest virus particles. And without them, the crystals don't form any more spontaneously than do living cells!

Again: For several years, the researchers at the Bell Laboratories worked on the problem of growing piezoelectric crystals for use as tuning elements in electronic circuits. Quartz crystals are just about ideal . . . but the natural supply was running out, and nobody knew how to grow quartz crystals. Over a period of a couple of years, the Bell Labs people worked out techniques for growing perfect, flawless crystals of ethylene diamine tartarate—crystals that did the required job very nicely. Production-line methods were developed, and regular production of the crystals was operating in full swing for several years . . . until one day, the thing came to a grinding halt. Their perfect crystals began coming out with a few small parasitic crystals, at first, then more and more of the parasitic crystals.

Investigation showed that the crystal parasites were a never-before-heard-of ethylene diamine tartarate monohydrate. There had been a mutation, and a new species had appeared in their nutrient broth—saturated ethylene diamine tartarate solution. That was the end of the EDT crystal production.

Fortunately, work on the quartz crystal problem had finally cracked the problem, and Bell Labs was able to produce quartz crystals commercially.

So . . . crystals arise spontaneously, unlike living forms? Anybody able to prove that conclusively? There's lots of evidence that they *don't* arise spontaneously; that there must be pre-existent seeds! The Bell Labs people had worked with tens of thousands of gallons of solution, with thousands of pounds of crystals . . . and done so for several years. Then suddenly, the new crystalline form appeared, and that was the end of the system.

The most important characteristic of a crystal is its form, its pattern. Alum is one of the easiest to grow; anyone starting home-grown experiments should start with that. Alums alone offer enough different problems and challenges to keep you going for years.

An alum is, essentially, a double sulfate of two metallic ions; one is a univalent ion such as potassium, sodium, ammonium, caesium, et cetera, and the other a trivalent ion such as ferric iron, chromium, or aluminum —the one which gave its name to the

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family. You might write the formula of an alum as:

$$\begin{matrix} K \\ Na \\ NH_4 \\ Cs \\ . \\ . \end{matrix} \left\{ \begin{matrix} Al \\ Cr \\ Fe \\ . \\ . \\ . \end{matrix} \right\} (SO_4)_2 : 12\ H_2O$$

The dots can stand for a variety of odd and esoteric elements such as thallium and iridium. Now the alums *do not exist in solution*; the solution is simply potassium sulfate and aluminum sulfate—the potassium and aluminum ions are in no way coupled in solution. It's the crystallizing forces that link them in the special alum arrangement.

Aluminum-potassium alum *always* contains exactly one Al atom for each K atom; the proportions are invariant.

But any two alums can be mixed in any proportions, and will co-crystallize together into single, perfect octahedral crystals of alums, in any proportions. Alum crystals form double square pyramids, base to base; $KCr(SO_4)_2 \cdot 12\ H_2O$ is deep purple . . . in sand-grain size crystals. In full-sized crystals the color is so intense, they're glossy, jet-black, and very handsome. Potassium-aluminum alum, $KAl(SO_4)_2 \cdot 12\ H_2O$ is glassy-clear and colorless; the crystalline form is the same as that of the diamond crystal. Various other alums have varying colors, depending on the trivalent element used. Since iridium sells for several hundred dollars an ounce, I don't recommend working with the rather soluble iridium alums, but the others make some interesting possibilities.

Chrome alum is so deeply colored, the crystal looks black; it can be co-crystallized in any proportions with aluminum alum, to yield crystals ranging from deep purple through pale bluish to water-white. A mixture of five parts Al alum to one part Cr alum gives a deeply colored green solution; remember that alums do not exist as such in solution—and chromium sulfate, unlike chromium alum, is green. But the crystals formed from that mixture are a beautiful amethyst.

At this point, some remarkable crystal-growing tricks become possible. If you make up a solution of the Al alum, one of straight Cr alum, and one of the mixed Al-Cr solution, you can start with a seed crystal in the Al solution, move it, after it's grown a bit, to the Cr alum solution, and let it grow some more. After a thin layer of the deep purple Cr alum has been formed, move it back to the Al alum. A layer of glassy clear Al alum forms. Move it back to the Cr alum for another thin layer of the deep purple. A little experimenting, and you can grow startlingly beautiful zebra-striped crystals—with the stripes actually layers of purple and clear. The whole can be finished off in the mixed alum, for a crystal-clear coating of amethyst.

Incidentally, the Cr alum is not stable in air of ordinary humidity; it will stand up nicely in an East-coast

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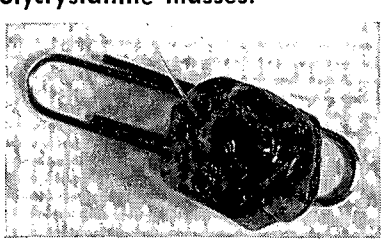
summer, with its usual sticky humidity, but won't last through the winter. Aluminum alum, however, holds onto its water of crystallization much more firmly. If you expose the Cr alum to air, it turns into a lavender powder and crumbles away. The five-to-one mixture of Al-Cr alums has the resistance of the Al alum, and is stable in normal climates.

The neatest way to show, visually, the repair power of crystals makes another use of the mixed-alums technique. Grow a crystal of either the amethyst mixture, or of Cr alum to about a one-half inch size. Then grind off one corner (it won't cut—the stuff is too brittle—but you can grind it down on sandpaper) until it is quite clearly a broken, or wounded, crystal. Now put it back in the clear alum solution; growth will start and the crystal-repair faculty begins operation. In a matter of a few days, a thin layer of water-white crystal will coat the whole crystal, while a mass of white "scar-tissue" forms over the broken corner. In another few days, a thick layer of glassy crystal encloses the whole structure—including the white scar-tissue area.

Unfortunately, I'm stuck with the fact that this is a highly visible, but practically unphotographable gimmick; it can be done with a truncated amethyst crystal in plain alum repair solution, and photographed in color very nicely. Trouble is . . . Analog can't as yet afford inside color plates. In black-and-white, the jet-black internal crystal looks like a simple hole, a break, in the crystal, and is about as uninspiring as a hole in anything else.

A better way of showing the process of crystal repair photographically is that series of the copper sulfate crystal on pages 83 and 84. The large crystal was broken; the chip is shown beside it. This series can't be done visually, of course; it's something like the fabled French museum that had on display the skull of Napoleon as a small boy. You can't both repair the crystal and have it on display as a broken crystal.

Cobalt sulfate—shown here—and a number of other substances I haven't been able to grow in clean, single crystals. The cobalt sulfate insists on forming lumpy, polycrystalline masses.



Many crystals cleave very nicely—nickel sulfate hexahydrate, for example, can be cleaved into neat, flat plates. This doesn't make much of a display as a "broken crystal"; copper sulfate, however, has an extremely complex crystalline form, and doesn't cleave. The fracture surface really *looks* like a fracture.

When put back in the "nutrient medium," healing starts—and the healing mechanism is quite clearly

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visible. Copper sulfate grows in beautifully transparent, deep-sky-blue crystals—which makes it more than somewhat difficult to photograph, incidentally. The repair process starts by throwing out new facets and lines and edges—sharply, regularly geometric pieces grow over the irregular fracture surface. Gradually the pieces grow together; fewer and fewer geometric-angular planes and faces remain, and finally the whole zone has been filled in with a solid mass of copper sulfate crystal, and has grown into perfect alignment with the undamaged part of the crystal.

But . . . it leaves "scar tissue." Whenever a crystal's growth is stopped and restarted, there's almost sure to be a veiling—a slight clouding, under the best of circumstances. (That's what makes getting perfect, flawless crystals so difficult—the growth must be continuous, or you get "growth rings" throughout the mass.) When the crystal heals, visual examination will show an area of veiling where the "scar tissue" repair mechanism grew together.

The last picture of the $CuSO_4$ crystal series shows the broken-off chip also "repaired" into a full-size crystal, in the juncture of two mirrors at 90°. The shape of a copper sulfate crystal is too complex to describe; only this four-sided view of it gives a visual suggestion of how intricately the facets and edges interact. On page 92 is a similar shot of a group of well-started copper sulfate seed crystals; note that each has almost, but not quite exactly, the same shape—but each has exactly the same arrangement of facets.

Properly grown, crystals come out of the solution with edges that are mathematically straight lines, and are razor sharp—handle with care!—because those edges are just about one molecule thick. The best technique I've found for getting them out and retaining their beauty is to wipe them off immediately—within seconds—on soft absorbent paper tissue. If you wash them, the water etches the surface and dulls the final sparkle. If you let them dry, the remaining solution deposits minute crystals that dust the brilliant facets.

Whatever the crystal, however, *form*, rather than *substance*, dominates; that's one reason why the alums are so interesting to study. The *form* of an alum crystal is the octahedron; the *substance* is relatively unimportant. It's as though a man building a house needed timbers of certain sizes—two-by-fours, eight feet long, say. Whether they were oak, pine, mahogany, or fir would make very little difference to him in getting the shape of structure he wanted, so long as they had the right shape. There would be limits, of course—balsa wouldn't do, because it's too soft and weak. Lignum vitae wouldn't do, because nails can't be driven into it.

Ferric potassium alum can—just barely—be prepared; ferric ammonium alum is stable and crystallizes nicely. Apparently ferric postassium alum is stretching the limits of the material requirements of the alum

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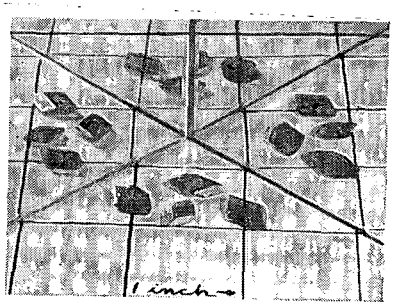


Copper sulfate seed crystals.

pattern. But *alum* is not a chemical substance; it's a pattern of crystallization.

In the cloud-seeding experiments, this phenomenon of pattern-vs.-substance was applied. The shape of a silver chloride crystal—the interatomic spacings, the pattern—very closely matches the pattern of an ice crystal. It's not the same—but so closely similar that it can act as a matrix on which supercooled water molecules can settle and start forming ice crystals. It's a "stereo-catalyst," in that it has the correct three-dimensional pattern to act as a matrix for the desired crystallization.

And what's an enzyme in a living organism? Currently, it appears to be a stereo-catalyst that has the correct spacings to allow a desired molecule to form.

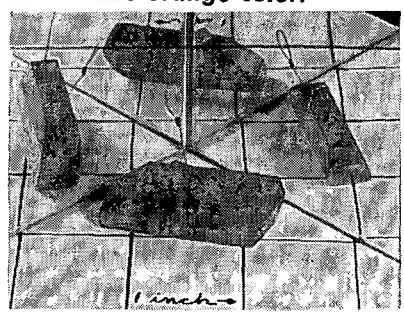
When men first made plutonium nitrate, they were producing a molecule that never existed on Earth before. Yet they were able to crystallize it—and obviously, they didn't have any seeds of that crystal to start with? Why didn't they wind up with the sort of problem the glycerine presented—no seeds: no crystals?

Chemically, uranium and the transuranic elements so far studied, are very closely similar—very much as the whole group of "rare-earth elements" near the middle of the periodic table are. It's probable that uranium nitrate crystal seeds could serve as matrix seeds for plutonium salts. If silver chloride can serve to start ice crystallizing, it's quite probable that something fairly common can serve as the trigger for plutonium and similar synthetic element compounds.

Cases like that of the ethylene diamine tartarate are decidedly unusual —probably because of that phenomenon of stereo-catalyst effects by quite alien substances.

However, the single instance of ethylene diamine tartarate demonstrates that there may well exist dozens of *possible* crystalline forms that no one has ever observed, because they've never happened—because the necessary "mutation" has never occurred.

Potassium bichromate — a brilliant flame-orange color.



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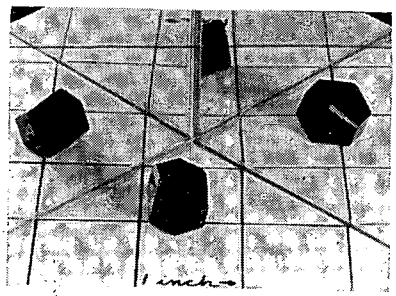
Important as form is, crystals are, like living things, able to adapt to environmental stresses. One of the simplest adaptations is shown by—again! alums. In neutral, or slightly acid solutions, they form octahedra; in strongly acid solutions, however, they crystallize in an entirely different shape, producing dodecahedra.

If you are not a practicing advanced inorganic chemist, you're apt to learn that inorganic chemistry, as taught in high schools and college courses other than advanced inorganic, neatly lead you all around the really tricky part of the subject. The most interesting crystals all involve the transition metals—chromium, manganese, iron, cobalt and nickel and copper. These elements are casually mentioned in ordinary inorganic chem textbooks, and then very hastily by-passed. It just happens that practically all the colored inorganic compounds—other than thoroughly insoluble oxides and sulfides—are compounds of those transition elements . . . and their chemistry is not anywhere near as simple as ordinary inorganic chem courses may have led you to believe.

Chromic salts are green; chromates give brilliant yellow, and dichromates are brilliant orange. Potassium dichromate crystals are beautiful, flaming orange.

Manganese sulfate solution is a sparkling-clear solution of delicate flesh-pink color. Manganates are green, and the permanganates are intensely magenta-colored. (Chlorates and perchlorates by contrast are perfectly colorless—though perchlorates and permanganates are, like the alums, isomorphous and can be co-crystallized. Thus potassium permanganate, intensely magenta, and potassium perchlorate co-crystallize in all porportions, to give crystals ranging from colorless through pinks to deep violet.)



Nickel sulfate hexahydrate—emerald green.

Iron salts tend toward the greenish—ferrous—or reddish-brown—ferric. Nickel salts are mostly emerald green, while cobalt salts run to reds, lavender, and blue. Cobalt sulfate is garnet-red, with brown undertones; the basic carbonate is a really remarkable lavender.

Copper, of course, gives blue and blue-green colors. The sulfate is a magnificent blue jewel; it's a shame it isn't hard and water-proof! But . . . it says in the chemistry texts that copper-lithium chloride makes deep ruby-red crystals. Mine came out dirty chartreuse.

Add potassium dichromate to nickel sulfate, and the greenish-yellow crystals that separate will be, obviously,

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nickel chromate. Only . . . they happen to be nickel-potassium sulfate, and nickel chromate won't crystallize. (Nickel has two valence possibilities, and in the presence of the powerfully oxidizing chromate radicle, it apparently can't decide what to be, and so never does get around to crystallizing decently.) Nickel-potassium sulfate is much less soluble than nickel sulfate, so that forms and crystallizes out.

Alum is, as I say, the place to start . . . but the brilliantly and beautifully colorful salts of chromium, manganese, nickel, and cobalt are attractive. Copper sulfate crystallizes well and easily; just make sure you use distilled water, and keep contamination out. And add a few cc's of sulfuric acid per litre of solution; copper is highly susceptible to alkaline contamination, and then produces veiled crystals.

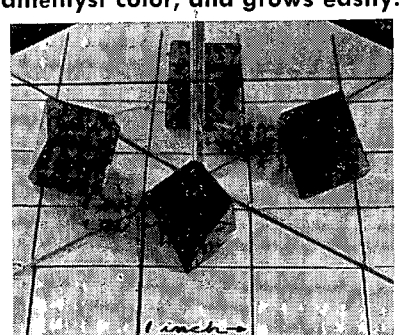
Nickel sulfate produces beautiful green crystals quite readily. However . . . here beginneth the tricky stuff. Nickel sulfate forms two hydrates; $NiSO_4 \cdot 7H_2O$ and $NiSO_4 \cdot 6H_2O$ The heptahydrate forms long, nearly-square cross-section bars; at room temperature, the heptahydrate is less soluble than the hexahydrate, and so it crystallizes out rather than the hexahydrate.

However, the heptahydrate is unstable in room air, loses water of crystallization and crumbles to a greenish white mess. Also, the crystal bars refuse to form up the ends of the bars—they are always ragged and unfinished.

Above 90°F. however, the hexahydrate is less soluble than the heptahydrate, so the hexahydrate tends to crystallize out. If a heptahydrate crystal is put into a saturated solution of $NiSO_4$ at 100°, it will slowly dissolve, while a heptahydrate crystal grows at its expense. The hexahydrate is a slightly different color, and forms the squared-off-barrel shaped crystal shown in the two-mirror shot on page 93. It forms up very nicely, and the crystal is stable in air.

There is one temperature—about 85°F—at which the two forms are equally soluble; at that temperature, the hexahydrate and the heptahydrate can be grown simultaneously in the same solution. Makes an interesting stunt—two very different crystals growing from the same solution under the same conditions. (Hm-m-m . . . Hey, Aristotle, what's this about nothing both *being* and *not being* at the same time in the same respect . . .?)

Mixed (5 to 1) potassium-aluminum and potassium-chromium alum crystal. The crystal is a true amethyst color, and grows easily.



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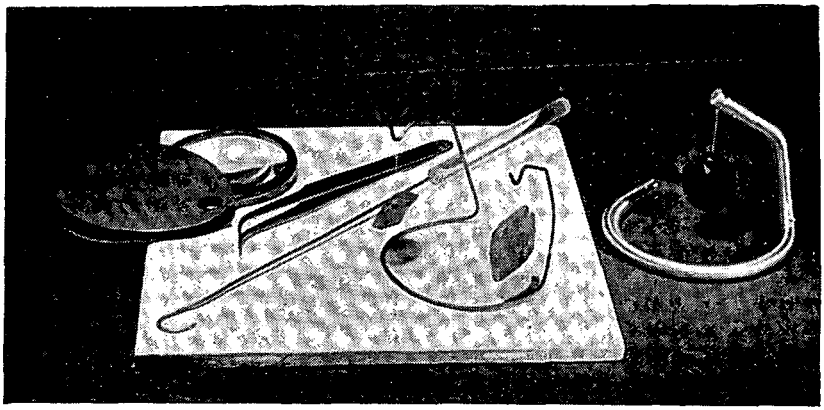

Tools of the trade. A white and a black ceramic tile make excellent working surfaces. Hand lens and tweezers are essential; the "fishing hook" is, like the smaller double-ended crystal support, made of tungsten wire, about #15 gauge. Tungsten and platinum are about the only metals that are immune to all the solutions you'll be likely to work with. The single-ended "cobra" is made of one-quarter inch Carpenter #20 Stainless; no ordinary "18-8 stainless steel" will resist nickel or manganese sulfate solutions—and *no* stainless will resist copper chloride.

Most of the tools required are quite simple and obvious—convenient glass jars, largely. Pyrex beakers, of course, are made for that sort of thing, but aren't necessary. Peanut butter jars work fine. And I recommend pieces cut from rubber-floor tile as lids, if you use the slow-evaporation method of growing crystals. You can cut slots of varying size in the tile-pieces, and regulate evaporation quite conveniently.

Filtering is going to be necessary; your local photography shop may prove a convenient source of a number of chemicals and items like polyethylene filter funnels. (Chrome alum is a standard stop-bath in photographic developing.) Chemex coffee filters are more widely available than standard chemical filter paper, and are perfectly good filter papers, of course.

Preparing solutions is not quite the simple matter of stirring chemicals into distilled water that it at first seems. (And use distilled water; it'll save you trouble and expense in the long run. Tap water has God-knows-what contaminants in it—usually alkalies that happily precipitate copper, nickel, and chromium, or chlorides, perhaps a trace of free chlorine to oxidize solutions. In some areas, you'll find that a little sulfide goes a long way to ruin things.)

The simplest way to prepare your

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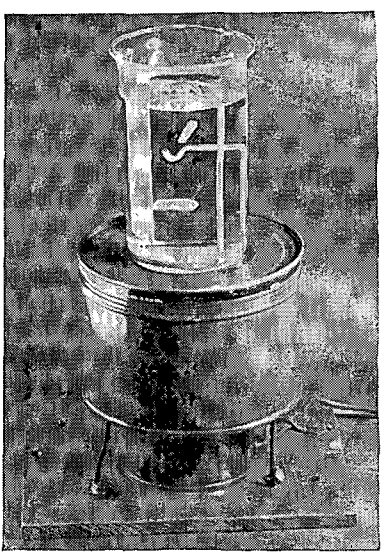
solution is to heat the water to about 150° or so—you don't need to take it up to boiling—and stir in your crystals. When the solution won't dissolve any more, pour it off from the crystals into a clean container, with just a few small crystals in it.

Now wait three days.

On that I'm not kidding. I don't know why; I'm simply stating experience. For some reason, it seems to take approximately three days for a solution to stabilize. If you put a seed-crystal into a freshly prepared solution, it may dissolve for no imaginable reason, or it may suddenly start sprouting dozens of unwanted side-crystals, while the solution suddenly starts snowing tiny crystals.

Half a cherry can, some heavy-gauge copper wire, and a coffee can make a highly useful stove for preparing solutions. A ceramic socket allows use of anything from 8 to 100 watts; highly useful for cooking up solutions, and rapid evaporation of too-dilute solutions.



Prepare a stock-reserve of the solution, to make up losses as the solution evaporates and deposits crystal material. Keep the reserve in a vapor-tight bottle standing near the working solution, and let it age, too. If you try adding a freshly prepared solution to your working solution, you can expect trouble. You may not have any . . . but you can't count on luck. If you are working with a warm solution—that nickel sulfate, for instance, running at 100° or so—then the reserve solution must be kept at the same temperature—and kept there for about three days, too.

Copper sulfate and alum are pretty rugged solutions; they work nicely under not-too-good conditions. The same can not be said for nickel sulfate, and is definitely not true of potassium dichromate. I have not yet been able to get a decent crystal of bright-yellow potassium chromate—and not for want of trying. Cobalt sulfate still defeats me, too; it insists on making large, knobby polycrystalline masses, instead of decent monocrystalline units.

Potassium dichromate will crystallize into large, brilliant crystals *if* (1) the temperature is held fairly close to constant—within about 2°F, and (2) it is allowed to crystallize only very slowly. Keep the rate of evaporation low, and constant.

That can be done during the winter

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in a thermostatically controlled heated house. In summer, it calls for a thermostatically controlled air-conditioner, plus a dehumidifier. To grow a crystal of $K_2Cr_2O_7$ an inch and a half long takes about two months. An alum crystal of equal mass can be grown in five days, if you push it a little.

And with the dichromate, you *must* use an old solution; let it age a week or so before trying anything really serious with it.

Getting seeds for the solutions is fairly simple, but tools are needed—and you have to invent and manufacture most of them. Corrosion is going to be your major enemy—and not always the solutions you expect to be corrosive. Potassium dichromate, for instance, is an extremely powerful oxidizing agent—it'll cause ulcers if you let it stand on your skin any length of time, and the dust of spilled-and-dried $K_2Cr_2O_7$ is decidedly bad for eyes and lungs—wipe it up carefully. Yet that solution isn't at all hard to handle, so far as corrosion goes.

The one that really chewed holes in things was the mild little nickel sulfate! $NiSO_4$ is really quite soluble; it takes about two pounds of $NiSO_4 \cdot 6H_2O$—the commercial form in which nickel sulfate is sold—to saturate one litre of water. The resulting solution is dense, and highly concentrated. You need to keep it slightly acid, because of the insolubility of the nickel hydroxides and basic salts—and that means that it is, effectively, a very concentrated solution of sulphuric acid, so far as corrosion of metals goes. It chews holes in most types of stainless steel. Nichrome wire—used in electric heating resistances—is a type of super-stainless steel; it goes to pieces in an hour or so in nickel sulfate. Lead dissolves, and makes the solution cloudy with white lead sulfate.

Manganese sulfate also proved to be highly corrosive to metals.

Copper sulfate can be handled very readily; copper wire and tools may corrode, but not seriously, and the corrosion will be nothing but a little more copper sulfate, so who cares.

Yet these metal-corroding solutions aren't as corrosive to organic matter as the dichromate solution! The dichromate, because it is a powerful oxidizer, immediately forms a coating of oxide on metals exposed to it . . . and the coating stops further action right there.

Plastics are your best materials, within their limitations. Since most of the standard plastics are hydrocarbon-based, they like wax, simply don't actually get wetted, and no corrosion results. Your local radio-TV shop probably has the "Radio Master" catalogue; in that, you'll find listed polystyrene rods, sheets and tubes; they're used in electronics because of the high insulating abilities of polystyrene, and they're reasonably cheap, and easy to work. Polystyrene cement will truly weld two pieces of poly together—and polystyrene cement proved to be the best glue for

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One coffee can plus six small ceramic sockets and a supply of Christmas tree bulbs make a low-energy stove for maintaining solution temperatures.

sticking seeds crystals on nylon support strings.

If you can work glass, that's even better, for most things, than plastic—but plastics can be worked with hand tools readily. The major trouble with plastic is that in dense solutions like nickel sulfate, the darned stuff floats, and you need an anchor weight to haul it down. Since not even lead is immune to the attack of some of the solutions, this gets to be difficult; ingenuity is a marked advantage in this hobby! Paints and lacquers over metal usually prove to have pinholes, with resultant peeling. I used a piece of three quarter inch poly rod, drilled with a half-inch hole, poured full of solder, and polystyrene-cemented to a polstyrene plate for my most-resistant.

You need some kind of plate to grow seed crystals—a plate you can lower into the solution, and haul out for selection of crystals. Rig it your own way!

You'll need needle-nose tweezers—preferably high-quality stainless-steel—and a magnifying glass, to pick out the best of the minute seeds; they'll start forming "spontaneously" from your solution after it's had a chance to age for a few days, when evaporation starts concentrating it. Keep the best seeds, and return them to the working solution. Pick 'em over again about twelve hours later. It takes only about two or three days to get a satisfactory supply of seed crystals.

Put all but one or two in a small bottle, and then start work on your growth project. Item The First is gluing the seed to a support thread. I use eight-pound-test monofilament nylon fishline. It won't corrode, and is so smooth it discourages unwanted volunteer crystals. It's also slippery as an eel, and as springy as a good spring steel, and will drive you to new cuss words before you get a technique for tying a loop in it where you need it. And what you want is a loop to suspend it at one end, and a knot at the other end, about an inch away. The knot is then smeared with a small drop of polystyrene cement, and that, in turn, stuck onto your seed crystal.

The resulting attachment is weak—but your crystal is small; when it grows, it grows around the string, and anchors itself very solidly to it.

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The crystals must, of course, be dry when you apply the glue; they can be dried by rolling them gently between your fingers in a piece of paper tissue of the *Kleenex* variety, and then air-drying for a few minutes. *If* your solution is truly saturated, when you put the crystal-and-string into it, the crystal will be insoluble, so the glue won't come loose. If the solution isn't completely saturated, you'll find that out in about five minutes; the glue will peel off and drop the crystal. If things are as they should be, the crystal will grow happily and firmly onto the cord.

Incidentally, I tried various other cements, glues, and stickums; there may well be others that work, but polystyrene cement did better than anything else I tried—to and including the fabulous epoxy resin glues, which peeled off with frustrating regularity. This despite the fact that polystyrene cement is, generally speaking, a very poor sort of glue; it's perfect for polystyrene, and nothing else except crystal growing!

Now cometh the stinker: the matter of what to hang the nylon string and crystal from. Again—if you can work glass, a "cobra" made of glass rod will work beautifully in any solution, having only the difficulty of being brittle. Otherwise, you can use heavy-gauge aluminum wire in the alum solutions—it may corrode, but it just makes more alum. Copper wire in copper sulphate, chloride, or what-ever. But you don't get nickel wire very readily, and such things as manganese and chromium wire are definitely not to be had. Of course, platinum wire would be just fine . . . at about five dollars an inch. I got hold of some Carpenter #20 stainless steel; this is a super-resistant, ultra-corrosion-proof stainless, and it will stand up to nickel and manganese sulfates . . . but in a cooper chloride solution it had corrosion pits in about thirty seconds. If you can get titanium wire, or zirconium wire, they'd do nicely.

I found that Central Scientific Company (Cenco) stocks tantalum and tungsten wire, and at not-impossible cost. Tantalum is malleable, somewhat soft, and proof against any ordinary acid medium; tungsten will resist anything short of boiling, concentrated potassium hydroxide. No acid will attack it, and nothing but the most virulent alkalies. It costs about five dollars for four feet of approximately #18 gauge, which is stiff, strong, and entirely satisfactory.

The one difficulty is that tungsten, at room temperature, is about like steel at liquid hydrogen temperatures; it's brittle. The wire can not be shaped at room temperature—it shatters. It can, however, be bent as readily as any ordinary metal if heated red hot; an ordinary alcohol lamp will do the job, and two pairs of pliers—with due caution not to have a red-hot length of tungsten wire whip around at you—does the job readily. The tungsten oxidizes somewhat in air at red heat, so try to keep the red-heat time down, but the oxide won't cause any trouble. It clings very solidly, and is as corrosion-resistant

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as the metal; it, too, yields only to boiling, concentrated KOH.

The tungsten wire can be shaped into wire "cobras" with either one, or two hooks for supporting crystals; it also makes a highly useful fishing-hook tool. Take a six inch length of the wire, form a hook in one end, and heat the other end and thrust it into a four to five inch length of quarter-inch plastic rod an inch or so. When the rod cools, it's welded in place solidly; the resultant tool is useful for fishing out the wire cobras, slipped-off crystals, and similar emergencies.

For heating solutions to mild temperatures—maintaining nickel sulfate at 100° for instance—or evaporating off excess water, a low-wattage electric stove is very useful. You can buy one for about seventy-five dollars; mine consists of a coffee can in which I mounted six porcelain miniature sockets. By screwing in from one to six Christmas tree bulbs, I have six levels of heating available. The top of the can is sprayed flat black inside and out, while the can itself is left with shiny metal sides; practically all the heat output of the bulbs appears in the top, where you want it.

Another tool of the greatest importance is the "Chemical Rubber Handbook;" it's got a wonderful list of inorganic compounds, their solubilities, crystalline forms, etcetera. Before starting on some interesting compound, look it up—some of 'em have incredibly perverse behavior. Manganese sulfate, for instance; it forms a beautiful flesh-pink solution, and crystallizes rapidly and smoothly into sparkling-clear rhombic crystals of the same delicate pink. They are gorgeous crystalline jewels . . . so long as you leave them in the solution. The stuff is efflorescent in air; it loses water of crystallization rapidly, and turns to an off-white powder. I tried enclosing the crystal in four coats of spray lacquer; it lasted three days before the creeping crud of efflorescence ruined it. There are special casting plastics, intended for mounting biological specimens; unfortunately they call for curing at about 130°C.—and $MnSO_4$ has remarkable characteristics. There are about half a dozen hydrates; one form is stable only between about −10° and 0°C.; the one stable at room temperature is unstable above about 40°C.

If you have some excess $MnSO_4$ crystals in a nice, clear solution and want to get them into solution by warming the solution to about 150°F. —what happens is that the whole solution turns sort of milky-pink, it snows off-white, microcrystals, and most of the stuff comes out of solution. At the higher temperature, a different hydrate forms, and it's not as soluble, so down it clanks. So now you cool off the solution again, and add a little water, and stir. And this means stir for about twelve to eighteen hours, with an electric stirrer, before you get the nice clear, sparkling solution again.

The pink solution, incidentally, is viscous—it has an oily thickness

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effect. Pour water into it, and the water floats on top; it'll continue floating there for days, if you don't stir it.

Then there are other crystals that would be nice . . . if they weren't deliquescent. i.e., they soak up water from the air, dissolve in it, and turn into a puddle.

I'm still trying to find an inorganic crystal that is a true, bright red, and is neither violently toxic, some platinum, gold, or iridium compound at fifty dollars a gram, under AEC license provisions, highly explosive, nor deliquescent. Ferric thiocynate might do, if it weren't deliquescent. The textbooks say that copper-lithium chloride forms ruby-red crystals; mine formed dirty-chartreuse crystals. (And rapidly ate holes in my stainless steel stirring rod.)

Any advanced inorganic chemists around who can suggest a practical true-red inorganic crystal? Or, for that matter, a practical pure-yellow crystal? Potassium chromate is true yellow—but it is not at all co-operative when it comes to crystallizing. Cobalt gives a dirty red—not a sparkling jewellike red.

A few final suggestions:

When I started this experiment, there was no satisfactory how-to-do-it book available. In January, 1960, however, "Crystals and Crystal Growing," by Alan Holden and Phyllis Singer was published by Doubleday Anchor in a paperback edition, selling for $1.45. It contains a lot of directly useful data on methods of crystal growing, and is strongly recommended.

The photographs for this article were taken with either a Mamayaflex Professional C 2¼ x 2¼ twin-lens reflex, which allows focusing without attachments to nearly 1-to-1 size, or the Nikon F 35mm camera with extension tubes. I regret that the high cost of color plates makes it impossible to do justice to the brilliant color of the crystals. Almost any single-lens reflex 35mm camera, with either lens-tube extensions if available, or with close-up auxiliary lenses, can get beautiful Kodachromes of the growing crystals.

With many of the crystals, it is not *necessary* to start seeds, and glue them to supporting nylon lines. Hang a weighted nylon thread from your wire crystal support, with a small droplet of dried, transparent glue on the thread as an irregularity. In the course of a few days in the growing solution, a "volunteer" crystal will usually grow of its own accord on the irregularity. Keep excess, unwanted crystals off the thread, snip off the no-longer-needed weight—the thread would tend to float without it or a crystal attached—and let the crystal grow. This is, incidentally, the only way you can get a perfectly flawless crystal; if the seed is grown separately, attached, and then grown, the crystal will have veils in the seed, and at the attachment. This system just takes more patience.

Potassium dichromate produces strikingly beautiful flame-orange

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crystals; they're anhydrous, and perfectly stable in air. But dichromates are extremely powerful oxidizing agents; paper filters tend to react with hot dichromate destructively. And unfiltered dichromate solution tends to produce veiled crystals. Solution: go to the local tropical-fish store, and buy glass-fiber for filtering. Use rubber work-gloves for handling the stuff—it goes into fingers easily, but getting it out is hell. Cut off—scissors do it neatly—a small piece, stuff it in the neck of a polyethylene plastic funnel, and pour your solution through it twice. First time through, any loose glass fibers, general crud, et cetera, tends to get lodged in the fiberglass plug; the second time through you have a really fine-grained filter as a result.

Some of the materials you may want to use are available in local drug and/or photographic stores, hardware shops, et cetera. Less common chemicals and materials, such as the tungsten wire, you'll have to order from specialized scientific supply companies.

Central Scientific, 237 Sheffield, Mountainside, New Jersey, is an example—and their policy is typical. They *will not sell to individuals*, and the minimum mail order is fifteen dollars. The reason for the minimum order is understandable; the not-to-individuals policy stems from experiences of this type: If someone sends for two pounds of sulfuric acid, two pounds of nitric acid, and a supply of glycerine, it might be he wanted the sulfuric acid for his storage battery, the nitric for cleaning stains off of stainless steel, and the glycerine for a hand lotion . . . but it sounds too much like someone about to try cooking up some home-brew nitroglycerine. And potassium chlorate, sulfur, zinc powder or charcoal sounds like someone with misguided ideas on home-brew rocket fuel. (That mixture is somewhat less safe to handle than nitroglycerine.)

If you have a company, send in your order on letterhead stationery; otherwise your local school department will gladly cooperate on such a project as crystal-growing.

THE END

DEFINITION

Automatic Computer Data Processing: Modernized ultra-high-speed red tape.

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(*Continued from page* 82)
on the small liner's way to Leningrad.

Of the tourists, some seventy-five or so, Hank estimated that all but half a dozen were convinced that Russian skunks didn't stink, in spite of the fact that thus far they'd never been there to have a whiff. The few such as Loo Motlamelle, who was evidently the son of some African paramount chief, and Paco Rodriquez, had also never been to Russia but at least had open minds.

Far from black bread and borscht, he found the food excellent. The first morning they found caviar by the pound nestled in bowls of ice, as part of breakfast. He said across the table to Paco, "Propaganda. I wonder how many people in Russia eat caviar."

Paco spooned a heavy dip of it onto his bread and grinned back. "This type of propaganda I can appreciate. You Yankees should try it."

Char was also eating at the other side of the community type table. She said, "How many Americans eat as well as the passengers on United States Lines ships?"

It was as good an opportunity as any for Hank to place his character in the eyes of his fellow Progressive Tours pilgrims. His need was to establish himself as a moderately square tourist on his way to take a look-see at highly publicized Russia. Originally, the C.I.A. men had wanted him to be slightly pro-Soviet, but he hadn't been sure he could handle that convincingly enough. More comfortable would be a role as an averagely anti-Russian tourist—not fanatically so, but averagely. If there were any KGB men aboard, he wanted to dissolve into mediocrity so far as they were concerned.

Hank said now, mild indignation in his voice. "Do you contend that the average Russian eats as well as the average American?"

Char took a long moment to finish the bite she had in her mouth. She shrugged prettily. "How would I know? I've never been to the Soviet Union." She paused for a moment before adding, "However, I've done a certain amount of traveling and I can truthfully say that the worst slums I have ever seen in any country that can be considered civilized were in the Harlem district and the lower East Side of New York."

All eyes were turned to him now, so Hank said, "It's a big country and there are exceptions. But on the average the United States has the highest standard of living in the world."

Paco said interestedly, "What do you use for a basis of measurement my friend? Such things as the number of television sets and movie theaters? To balance such statistics, I understand that per capita your country has the fewest number of legitimate theaters of any of—I use Miss Moore's term—the civilized countries."

A Londoner, two down from Hank, laughed nastily. "Maybe schooling, is the way he measures. I read in the *Express* the other day that even after Yankees get out of college they can't read proper. All they learn is driving

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cars and dancing and togetherness—wotever that is."

Hank grinned inwardly and thought, *You don't sound as though you read any too well yourself, my friend.* Aloud he said, "Very well, in a couple of days we'll be in the promised land. I contend that free enterprise performs the greatest good for the greatest number."

"Free enterprise," somebody down the table snorted. "That means the freedom for the capitalists to pry somebody else out of the greater part of what he produces."

By the time they'd reached Leningrad, aside from Paco and Loo, his cabinmates, Hank had built an Iron Curtain all of his own between himself and the other members of the Progressive Tours trip. Which was the way he wanted it. He could foresee a period when having friends might be a handicap when and if he needed to drift away from the main body for any length of time.

Actually, the discussions he ran into were on the juvenile side. Hank Kuran hadn't spent eight years of his life as a field man working against the Soviet countries in the economic sphere without running into every argument both pro and con in the continuing battle between Capitalism and Communism. Now he chuckled to himself at his getting into tiffs over the virtues of Russian black bread versus American white, or whether Soviet jets were faster than those of the United States.

With Char Moore, though she tolerated Hank's company, in fact, seemed prefer it to that of whatever other males were aboard, it was continually a matter of rubbing fur the wrong way. She was ready to battle it out on any phase of politics, international affairs, or West versus East.

But it was the visitors from space that actually dominated the conversation of the ship—crew, tourists, business travelers, or whoever. Information was still limited, and Taas the sole source. Daily there were multilingual radio broadcasts tuned in by the *Baltika* but largely they added little to the actual information on the extraterrestrials. It was mostly Soviet back-patting on the significance of the fact that the Galactic Confederation emissaries had landed in the Soviet complex rather than among the Western countries.

Hank learned little that he hadn't already known. The Kremlin had all but laughingly declined a suggestion on the part of Switzerland that the extraterrestrials be referred to the all but defunct United Nations. The delegates from the Galactic Confederation had chosen to land in Moscow. In Moscow they should remain until they desired to go elsewhere. The Soviet implication was that the alien emissaries had no desire, intention nor reason to visit other sections of Earth. They had contacted the dominant world power and could complete their business within the Kremlin walls.

Leningrad came as only a mild surprise to Henry Kuran. With his knowledge of Russian and his posi-

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tion in Morton Twombly's department, he had kept up with Soviet progress through the years.

As early as the middle 1950s unbiased travelers to the U.S.S.R. had commented in detail upon the explosion of production in the country. By the end of the decade such books as Gunther's "Inside Russia Today" had dwelt upon the ultra-cleanliness of the cities, the mushrooming of apartment houses, the easing of the restrictions of Stalin's day—or at least the beginning of it.

He actually hadn't expected peasant clad, half starved Russians furtively shooting glances at their neighbors for fear of the secret police. Nor a black bread and cabbage diet. Nor long lines of the politically suspect being hauled off to Siberia. But on the other hand he was unprepared for the prosperity he did find.

Not that this was any paradise, worker's or otherwise. But it still came as a mild surprise. Henry Kuran couldn't remember so far back that he hadn't had his daily dose of anti-Russianism. Not unless it was for the brief respite during the Second World

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War when for a couple of years the Red Army had been composed of heroes and Stalin had overnight become benevolent old Uncle Joe.

There weren't as many cars on the streets as in American cities, but there were more than he had expected nor were they 1955 model Packards. So far as he could see, they were approximately the same cars as were being turned out in Western Europe.

Public transportation, he admitted, was superior to that found in the Western capitals. Obviously, it would have to be; without automobiles, buses, streetcars and subways would have to carry the brunt of traffic. However, it was the spotless efficiency of public transportation that set him back.

The shops were still short of the pinnacles touched by Western capitals. They weren't empty of goods, luxury goods as well as necessities, but they weren't overflowing with the endless quantities, the hundred-shadings of quality and fashion that you expected in the States.

But what struck nearest to him was the fact that the people in the streets were not broken spirited, depressed, humorless drudges. In fact, why not admit it, they looked about the same as people in the streets anywhere else. Some laughed, some looked troubled. Children ran and played. Lovers held hands and looked into each other's eyes. Some reeled under an overload of vodka. Some hurried along, business bent. Some dawdled, window shopped, or strolled along for the air. Some read books or newspapers as they shuffled, radar directed, and unconscious of the world about them.

They were only a day and half in Leningrad. They saw the Hermitage, comparable to the Louvre and far and above any art museum in America. They saw the famous subway—which deserved its fame. They were ushered through a couple of square miles of the Elektrosile electrical equipment works, claimed ostentatiously by the guide to be the largest in the world. They ate in restaurants as good as any Hank Kuran had been able to afford at home and stayed one night at the Astoria Hotel.

At least, Hank had the satisfaction of grumbling about the plumbing.

Paco and Loo, the only single bachelors on the tour besides himself, were again quartered with him at the Astoria.

Paco said, "My friend, there I agree with you completely. America has the best plumbing in the world. And the most."

Hank was pulling off his shoes after an arch-breaking day of sightseeing. "Well, I'm glad I've finally found some field where it's agreeable that the West is superior to the Russkies."

Loo was stretched out on his bed, in stocking feet, gazing at the ceiling which towered at least fifteen feet above him. He said, "In the town where I was born, there were three bathrooms, one in the home of the missionary, one in the home of the commissioner and one in my father's palace." He looked up at Hank. "Or

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is my country considered part of the Western World?"

Paco laughed. "Come to think of it, I doubt if one third the rural homes of Argentina have bathrooms. Hank, my friend, I am afraid Loo is right. You use the word *West* too broadly. All the capitalist world is not so advanced as the United States. You have been very lucky, you Yankees."

Hank sank into one of the huge, Victorian era armchairs. "Luck has nothing to do with it. America is rich because private enterprise *works*."

"Of course," Paco pursued humorously, "the fact that your country floats on a sea of oil, has some of the riches forest land in the world, is blessed with some of the greatest mineral deposits anywhere, and millions of acres of unbelievably fertile land, has nothing to do with it."

"I get your point," Hank said. "The United States was handed the wealth of the world on a platter. But that's only part of it."

"Yes," Loo agreed. "Also to be considered is the fact that for more than a hundred years you have never had a serious war, serious, that is, in that your land was not invaded, your industries destroyed."

"That's to our credit. We're a peace loving people."

Loo laughed abruptly. "You should tell that to the American Indians."

Hank scowled over at him. "What'd you mean by that, Loo? That has all the elements of a nasty crack."

"Or tell it to the Mexicans. Isn't that where you got your whole Southwest?"

Hank looked from Loo to Paco and back.

Paco brought out cigarettes and tossed one to each of the others. "Aren't these long Russian cigarettes the end? I heard somebody say that by the time the smoke got through all the filter, you'd lost the habit." He looked over at Hank. "Easy my friend, easy. On a trip like this it would be impossible not to continually be comparing East and West, dwelling continually on politics, the pros and cons of both sides. All of us are continually assimilating what we hear and see. Among other things, I note that on the newsstands there are no publications from western lands. Why? Because still, after fifty years, our Communist bureaucracy dare not allow its people to read what they will. I note, too, that the shops on 25th October Avenue are not all directed toward the Russian man in the street, unless he is paid unbelievably more than we have heard. Sable coats? Jewelry? Luxurious furniture? I begin to suspect that our Soviet friends are not quite so classless as Mr. Marx had in mind when he and Mr. Engels worked out the rough framework of the society of the future."

Loo said seriously, "Oh, there are a great many things of that type to notice here in the Soviet Union."

Hank had to grin. "Well, I'm glad you jokers still have open minds."

Paco waggled a finger negatively

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at him. "We've had open minds all along, my friend. It is yours that seems closed. In spite of the fact that I spent four years in your country I sometimes confess I don't understand you Americans. I think you are too emersed in your TV programs, your movies and your light fiction."

"I can feel myself being saddled up again," Hank complained. "All set for another riding."

Loo laughed softly, his perfect white teeth gleaming in his black face.

Paco said, "You seem to have the fictional *good guys and bad guys* outlook. And, in this world of controversy, you assume that you are the good guys, the heroes, and since that is so then the Soviets must be the bad guys. And, as in the movies, everything the good guys do is fine and everything the bad guys do, is evil. I sometimes think that if the Russians had developed a cure for cancer first you Americans would have refused to use it."

Hank had had enough. He said, "Look, Paco, there are two hundred million Americans. For you, or anyone else, to come along and try to lump that many people neatly together is pure silliness. You'll find every type of person that exists in the world, in my country. The very tops of intelligence, and submorons living in institutions; the most highly educated of scientists, and men who didn't finish grammar school; you'll find saints, and gangsters; infant prodigies and juvenile delinquents; and millions upon millions of just plain ordinary people much like the people of Argentina, or England, or France or wherever. True enough, among all our two hundred million there are some mighty prejudiced people, some mighty backward ones, and some downright foolish ones. But if you think the United States got to the position she's in today through the efforts of a whole people who are foolish, then you're obviously pretty far off the beam yourself."

Paco was looking at him narrowly. "Accepted, friend Hank, and I apologize. That's quite the most effective outburst I've heard from you in this week we've known each other. It occurs to me that perhaps you are other than I first thought."

Oh, oh. Hank backtracked. He said, "Good grief, let's drop it."

Paco said, "Well, just to change the subject, gentlemen, there is one thing above all that I noted here in Leningrad."

"What was that?" Loo said.

"It's the only town I've ever seen where I felt an urge to kiss a cop," Paco said soulfully. "Did you notice? Half the traffic police in town are cute little blondes."

Loo rolled over. "A fascinating observation, but personally I am going to take a nap. Tonight it's the Red Arrow Express to Moscow and rest might be in order, particularly if the train has square wheels, burns wood and stops and repairs bridges all along the way, as I'm sure Hank believes."

Hank reached down, got hold of

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one of his shoes and heaved it.

"Missed!" Loo grinned.

The Red Arrow Express had round wheels, burned Diesel fuel and made the trip between Leningrad and Moscow overnight. In one respect, it was the most unique train ride Hank Kuran had ever had. The track contained not a single curve from the one city to the other. Its engineers must have laid the roadbed out with a ruler.

The cars, like the rest of public transportation, were as comfortable as any Hank knew. Traveling second class, as the Progressive Tours pilgrims did, involved four people in a compartment for the night, with one exception. At the end of the car was a smaller compartment containing two bunks only.

The Intourist guide who had shepherded them around Leningrad took them to the train, saw them all safely aboard, told them another Intourist employee would pick them up at the station in Moscow.

It was late. Hank was assigned the two-bunk compartment. He put his glasses on the tiny window table, sat on the edge of the lower and began to pull off his shoes. He didn't look up when the door opened until a voice said, icebergs dominating the tone, "Just what are you doing in here?"

Hank blinked up at her. "Hello, Char. What?"

Char Moore snapped, "I said, what are you doing in my compartment?"

"Yours? Sorry, the conductor just assigned me here. Evidently there's been some mistake."

"I suggest you rectify it, Mr. Stevenson."

Out in the corridor a voice, heavy with Britishisms, complained plaintively, "Did you ever hear the loik? They put men and women into the same compartment. Oim expected to sleep with a loidy in the bunk under me."

Hank cleared his throat, didn't allow himself the luxury of a smile. He said, "I'll see what I can do, Char. Seems to me I did read somewhere that the Russkies see nothing wrong in putting strangers in the same sleeping compartment."

Char Moore stood there, saying nothing but breathing deeply enough to express American womanhood insulted.

"All right, all right," he said, retying his shoes and retrieving his glasses. "I didn't engineer this." He went looking for the conductor.

He was back, yawning by this time, fifteen minutes later. Char Moore was sitting on the side of the bottom bunk, sipping a glass of tea that she'd bought for a few kopecks from the portress. She looked up coolly as he entered, but her voice was more pleasant. "Get everything fixed?"

Hank said, "What bunk do you want, upper or lower?"

"That's not funny."

"It's not supposed to be." Hank pulled his bag from under the bunk and from it drew pajamas and his

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dressing gown. "Check with the rest of the tour if you want. The conductor couldn't care less. We were evidently assigned compartments by Intourist and where we were assigned we'll sleep. Either that or you can stand in the corridor all night. I'll be damned if I will."

"You don't have to swear," Char bit out testily. "What are we going to do about it?"

"I just told you what I was going to do." Taking up his things he opened the door. "I'll change in the men's dressing room."

"I'll lock the door," Char Moore snapped.

Hank grinned at her. "I'll bet that if you do the conductor either has a passkey or will break it down for me."

When he returned in slippers, nightrobe and pajamas, Char was in the upper berth, staring angrily at the compartment ceiling. There were no hooks or other facilities for hanging or storing clothes. She must have put all of her things back into her bag. Hank grinned inwardly, carefully folded his own pants and jacket over his suitcase before climbing into the bunk.

"Don't snore, do you?" he said conversationally.

No answer.

"Or walk in your sleep?"

"You're not funny, Mr. Stevenson."

"That's what I like about this country," Hank said. "Progressive. Way ahead of the West. Shucks, modesty is a reactionary capitalistic anachronism. Shove 'em all into bed together, that's what I always say." He laughed.

"Oh, shut up," Char said. But then she laughed, too. "Actually, I suppose there's nothing wrong with it. We are rather Victorian about such things in the States."

Hank groaned. "There you are. If a railroad company at home suggested you spend the night in a compartment with a strange man, you'd sue them. But here in the promised land it's O.K."

After a short silence Char said, "Hank, why do you dislike the Soviet Union so much?"

"Why? Because I'm an American!"

She said, so softly as to be almost inaudible, "I've known you for a week now. Somehow you don't really seem to be the type who would make that inadequate a statement."

Hank said, "Look, Char. There's a cold war going on between the United States and her allies and the Soviet complex. I'm on our side. It's going to be one or the other."

"No it isn't, Hank. If it ever breaks out into hot war, it's going to be both. That is, unless the extra-terrestrials add some new element to the whole disgusting situation."

"Let's put it another way. Why are you so pro-Soviet?"

She raised herself on one elbow and scowled down over the edge of her bunk at him. Inside, Hank turned over twice to see the unbound red hair, the serious green eyes. Imagine looking at that face over the

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breakfast table for the rest of your life. The hell with South American senoritas.

Char said earnestly, "I'm not. Confound it, Hank, can't the world get any further than this cowboys and Indians relationship between nations? Our science and industry has finally developed to the point where the world could be a paradise. We've solved all the problems of production. We've conquered all the major diseases. We have the wonders of eternity before us—and look at us."

"Tell that to the Russkies and their pals. They're out for the works."

"Well, haven't we been?"

"The United States isn't trying to take over the world."

"No? Possibly not in the old sense of the word, but aren't we trying desperately to sponsor our type of government and social system everywhere? Frankly, I'm neither pro-West nor pro-Soviet. I think they're both wrong."

"Fine," Hank said. "What is your answer?"

She remained silent for a long time. Finally, "I don't claim to have an answer. But the world is changing like crazy. Science, technology, industrial production, education, population all are mushrooming. For us to claim that sweeping and basic changes aren't taking place in the Western nations is just nonsense. Our own country's institutions barely resemble the ones we had when you and I were children. And certainly the Soviet Union has changed and is changing from what it was thirty or forty years ago."

"Listen, Char," Hank said in irritation, "you still haven't come up with any sort of an answer to the cold war."

"I told you I hadn't any. All I say is that I'm sick of it. I can't remember so far back that there wasn't a cold war. And the more I consider it the sillier it looks. Currently the United States and her allies spend between a third and a half of their gross national product on the military —ha! the military!—and in fighting the Soviet complex in international trade."

"Well," Hank said, "I'm sick of it, too, and I haven't any answer either, but I'll be darned if I've heard the Russkies propose one. And just between you and me, if I had to choose between living Soviet style and our style, I'd choose ours any day."

Char said nothing.

Hank added flatly, "Who knows, maybe the coming of these Galactic Confederation characters will bring it all to a head."

She said nothing further and in ten minutes the soft sounds of her breathing had deepened to the point that Hank Kuran knew she slept. He lay there another half hour in the full knowledge that probably the most desirable woman he'd ever met was sleeping less than three feet away from him.

Leningrad had cushioned the first impressions of Moscow for Henry

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Kuran. Although, if anything, living standards and civic beauty were even higher here in the capital city of world Communism.

They pulled into the Leningradsky Station on Komsomolskaya Square in the early morning to be met by Intourist guides and buses.

Hank sat next to Char Moore still feeling on the argumentative side after their discussion of the night before. He motioned with his head at some excavation work going on next to the station. "There you are. Women doing manual labor."

Char said, "I'm from the Western states, it doesn't impress me. Have you ever seen fruit pickers, potato diggers, or just about any type of itinerant harvest workers? There is no harder work and women, and children for that matter, do half of it at home."

He looked at the husky, rawboned women laborers working shoulder to shoulder with the men. "I still don't like it."

Char shrugged. "Who does? The sooner we devise machines to do all the drudgery the better off the world will be."

To his surprise, Hank found Moscow one of the most beautiful cities he had ever observed. Certainly the downtown area in the vicinity of the Kremlin compared favorably with any.

The buses whisked them down through Lermontovskaya Square, down Kirov Street to Novaya and then turned right. The Intourist guide made with a running commentary. There was the famous Bolshoi Theater and there Sverdlova Square, a Soviet cultural center.

Hank didn't know it then but they were avoiding Red Square. They circled it, one block away, and pulled onto Gorky Street and before a Victorian period building.

"The Grand Hotel," the guide announced, "where you will stay during your Moscow visit."

Half a dozen porters began manhandling their bags from the top of the bus. They were ushered into the lobby and assigned rooms. Russian hotel lobbies were a thing apart. No souvenir stands, no bellhops, no signs saying *To the Bar, To the Barber Shop* or to anything else. A hotel was a hotel, period.

Hank trailed Loo and Paco and three porters to the second floor and to the room they were assigned in common. Like the Astoria's rooms, in Leningrad, it was king-sized. In fact, it could easily have been divided into three chambers. There were four full sized beds, six arm chairs, two sofas, two vanity tables, a monstrous desk —and one wash bowl which gurgled when you ran water.

Paco, hands on hips, stared around. "A dance hall," he said. "Gentlemen, this room hasn't changed since some Grand Duke stayed in it before the revolution."

Loo, who had assumed his usual prone position on one of the beds, said, "From what I've heard about Moscow housing, you could get an average family in this amount of space."

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Hank was stuffing clothes into a dresser drawer. "Now who's making with anti-Soviet comments?"

Paco laughed at him. "Have you ever seen some of the housing in the Harlem district in New York? You can rent a bed in a room that has possibly ten beds, for an eight-hour period. When your eight hours are up you roll out and somebody else rolls in. The beds are kept warm, three shifts every twenty-four hours."

Hank shook his head and muttered, "They call me Dobbin, I've been ridden so much."

Paco laughed and rubbed his hands together happily. "It's still early. We have nothing to do until lunch time. I suggest we sally forth and take a look at Russian womanhood. One never knows."

Loo said, "As an alternative, I suggest we rest until lunch."

Paco snorted. "A rightest-Trotskyite wrecker, and an imperialist warmonger to boot."

Loo said, dead panned, "Smile when you say that, stranger."

Hank said, "Hey, wait a minute."

He went down the room to the far window and bug-eyed. One block away, at the end of Gorky Street, was Red Square. St. Basil's Cathedral at the far end, an unbelievable candy-cane construction of fanciful spirals, and every-colored turrets; the red marble mausoleum, Mecca of world Communism, housing the prophet Lenin and his two disciples; the long drab length of the GUM department store opposite. But it wasn't these.

There on the square, nestled in the corner between St. Basil's and the mausoleum, squatted what Henry Kuran had never really expected to see, in spite of his assignment, in spite of news broadcasts, in spite of everything to the contrary. Boomerang shaped, resting on short stilts, six of them in all, a baby blue in color —an impossibly beautiful baby blue.

The spaceship.

Paco stood at one shoulder, Loo at the other.

For once there was no humor in Paco's words. "There it is," he said. "Our visitors from the stars."

"Possibly our teachers from the stars," Hank said huskily.

"Or our judges." Loo's voice was flat.

They stood there for another five minutes in silence. Loo said finally, "Undoubtedly our Intourist guides will take us nearer, if that's allowed, later during our stay. Meanwhile, my friends, I shall rest up for the occasion."

"Let's take our quick look at the city," Paco said ot Hank. "Once the Intourist people take over they'll run our feet off. Frankly, I have little interest in where the first shot of the revolution was fired, the latest tractor factory, or where Rasputin got it in the neck. There are more important things."

"We know," Loo said from the bed. "Women."

"Right!"

Hank was wondering whether or not to leave the room. The *Stilyagi* were to contact him. Where? When?

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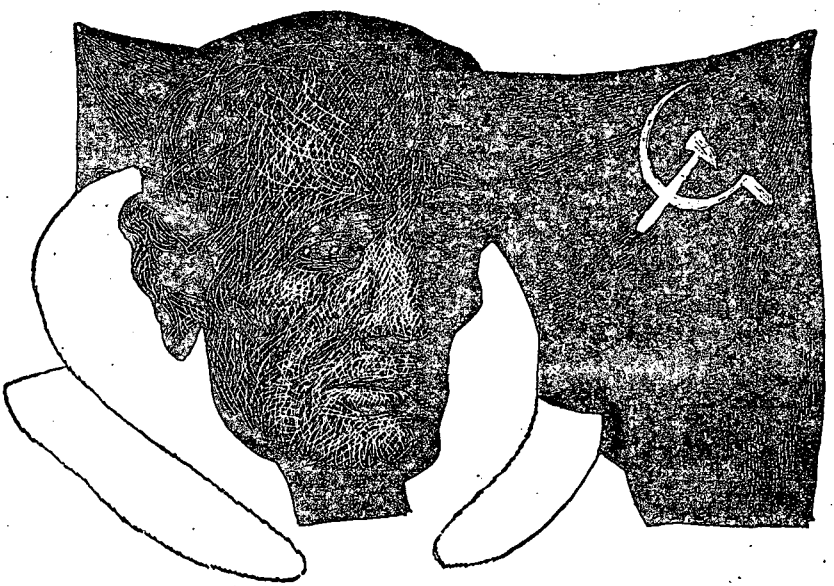

Obviously, he'd need their help. He had no ideas whatsoever on how to penetrate to the Interplanetary emissaries.

He spoke Russian. Fine. So what? Could he simply march up to the spacecraft and knock at the door? Or would he make himself dangerously conspicuous by just getting any closer than he now was to the craft?

As he stood now, he felt he was comparatively safe. He was sure the Russkies had marked him down as a rather ordinary American. Heavens knows, he'd worked hard enough at the role. A simple, average tourist, a little on the square side, and not even particularly articulate.

However, he wasn't going to accomplish much by remaining here in this room. He doubted that the *Stilyagi* would get in touch with him either by phone or simply knocking at the door.

"O.K., Paco," he said. "Let's go. In search of the pin-up girl—Moscow style."

They walked down to the lobby and started for the door.

One of the Intourist guides who had brought them from the railroad station stood to one side of the stairs. "Going for a walk, gentlemen? I suggest you stroll up Gorky Street, it's the main shopping center."

Paco said, "How about going over into Red Square to see the spaceship?"

The guide shrugged. "I don't believe the guards will allow you to get too near. It would be undesirable

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to bother the Galactic delegates to the Soviet Union."

That was one way of wording it, Hank thought glumly. *The Galactic delegates to the Soviet Union.* Not to the Earth, but to the Soviet Union. He wondered what the neutrals in such countries as India were thinking.

But at least there were no restrictions on Paco and him.

They strolled up Gorky Street, jam packed with fellow pedestrians. Shoppers, window-shoppers, men on the prowl for girls, girls on the prowl for men, Ivan and his wife taking the baby for a stroll, street cleaners at the endless job of keeping Moscow's streets the neatest in the world.

Paco pointed out this to Hank, Hank pointed out that to Paco. Somehow it seemed more than a visit to a western European nation. This was Moscow. This was the head of the Soviet snake.

And then Hank had to laugh inwardly at himself as two youngsters, running along playing tag in a grown-up world of long legs and stolid pace, all but tripped him up. Head of a snake it might be, but Moscow's people looked astonishingly like those of Portland, Maine or Portland, Oregon.

"How do you like those two, coming now?" Paco said.

Those two coming now consisted of two better than averagely dressed girls who would run somewhere in their early twenties. A little too much make-up by western standards, and clumsily applied.

"Blondes," Paco said soulfully.

"They're all blondes here," Hank said.

"Wonderful, isn't it?"

The girls smiled at them in passing and Paco turned to look after, but they didn't stop. Hank and Paco went on.

It didn't take Hank long to get onto Paco's system. It was beautifully simple. He merely smiled widely at every girl that went by. If she smiled back, he stopped and tried to start a conversation with her.

He got quite a few rebuffs but—Hank remembered an old joke—on the other hand he got quite a bit of response.

Before they had completed a block and a half of strolling, they were standing on a corner, trying to talk with two of Moscow's younger set—female variety. Here again, Paco was a wonder. His languages were evidently Spanish, English and French but he was in there pitching with a language the full vocabulary of which consisted of *Da* and *Neit* so far as he was concerned.

Hank stood back a little, smiling, trying to stay in character, but in amused dismay at the other's aggressive abilities.

Paco said, "Listen, I think I can get these two to come up to the room. Which one do you like?"

Hank said, "If they'll come up to the room, then they're professionals."

Paco grinned at him. "I'm a professional, too. A lawyer by trade. It's just a matter of different professions."

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A middle-aged pedestrian, passing by, said to the girls in Russian, "Have you no shame before the foreign tourists?"

They didn't bother to answer. Paco went back to his attempt to make a deal with the taller of the two.

The smaller, who sported astonishingly big and blue eyes, said to Hank in Russian, "You're too good to associate with *metrofanushka* girls?"

Hank frowned puzzlement. "I don't speak Russian," he said.

She laughed lightly, almost a giggle, and, in the same low voice her partner was using on Paco, said, "I think you do, Mr. Kuran. In the afternoon, tomorrow, avoid whatever tour the Intourist people wish to take you on and wander about Sovietska Park." She giggled some more. The world-wide epitome of a girl being picked up on the street.

Hank took her in more closely. Possibly twenty-five years of age. The skirt she was wearing was probably Russian, it looked sturdy and durable, but the sweater was one of the new American fabrics. Her shoes were probably western too, the latest flared heel effect. A typical *stilyagi* or *metrofanushka* girl, he assumed. Except for one thing—her eyes were cool and alert, intelligent beyond those of a street pickup.

Paco said, "What do you think, Hank? This one will come back to the hotel with me."

"Romeo, Romeo," Hank sighed, "wherefore do thou think thou art?"

Paco shrugged. "What's the difference? Buenos Aires, New York, Moscow. Women are women."

"And men are evidently men," Hank said. "You do what you want."

"O.K., friend. Do you mind staying out of the room for a time?"

"Don't worry about me, but you'll have to get rid of Loo, and he hasn't had his eighteen hours sleep yet today."

Paco had his girl by the arm. "I'll roll him into the hall. He'll never wake up."

Hank's girl made a moue at him, shrugged as though laughing off the fact that she had been rejected, and disappeared into the crowds. Hank stuck his hands in his pockets and went on with his stroll.

The contact with the underground had been made.

Maintaining his front as an American tourist he wandered into several stores, picked up some amber brooches at a bargain rate, fingered through various books in English in an international bookshop. That was one thing that hit hard. The bookshops were packed. Prices were remarkably low and people were buying. In fact, he'd never seen a country so full of people reading and studying. The park benches were loaded with them, they read as they rode on streetcar and bus, they read as they walked along the street. He had an uneasy feeling that the jet-set kids were a small minority, that the juvenile delinquent problem here wasn't a fraction what it was in the West.

He'd expected to be followed. In

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fact, that had puzzled him when he first was given this unwanted assignment by Sheridan Hennessey. How was he going to contact this so-called underground if he was watched the way he had been led to believe Westerners were?

But he recalled their conducted tour of the Hermitage Museum in Leningrad. The Intourist guide had started off with twenty-five persons and had clucked over them like a hen all afternoon. In spite of her frantic efforts to keep them together, however, she returned to the Astoria Hotel that evening with eight missing—including Hank and Loo who had wandered off to get a beer.

The idea of the KGB putting tails on the tens of thousands of tourists that swarmed Moscow and Leningrad, became a little on the ridiculous side. Besides, what secret does a tourist know, or what secrets could he discover?

At any rate, Hank found no interference in his wanderings. He deliberately avoided Red Square and its spaceship, taking no chances on bringing himself to attention. Short of that locality, he wandered freely.

At noon they ate at the Grand and the Intourist guide outlined the afternoon program which involved a general sightseeing tour ranging from the University to the Park of Rest and Culture, Moscow's equivalent of Coney Island.

Loo said, "That all sounds very tiring, do we have time for a nap before leaving?"

"I'm afraid not, Mr. Motlamelle," the guide told him.

Paco shook his head. "I've seen a university, and I've seen a sport stadium and I've seen statues and monuments. I'll sit this one out."

"I think I'll lie this one out," Loo said. He complained plaintively to Hank. "You know what happened to me this morning, just as I was napping up in our room?"

"Yes," Hank said. "I was with our Argentine Casanova when he picked her up."

Hank took the conducted tour with the rest. If he was going to beg off the next day, he'd be less conspicuous tagging along on this one. Besides it gave him the lay of the land.

And he took the morning trip the next day, the automobile factories on the outskirts of town. It had been possibly fifteen years since Hank had been through Detroit but he doubted greatly that automation had developed as far in his own country as it seemed to have here. Or, perhaps, this was merely a showplace. But he drew himself up at that thought. That was one attitude the Western world couldn't afford—deprecating Soviet progress. This was the very thing that had led to such shocks as the launching of the early Sputniks. Underestimate your adversary and sooner or later you paid for it.

The Soviets had at long last built up a productive machine as great as any. Possibly greater. In sheer tonnage they were turning out more gross national product than the West. This

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was no time to be underestimating them.

All this was a double interest to a field man in Morton Twombly's department, working against the Soviets in international trade. He was beginning to understand at least one of the reasons why the Commies could sell their products at such ridiculously low prices. Automation beyond that of the West. In the Soviet complex the labor unions were in no position to block the introduction of ultra-efficient methods, and featherbedding was unheard of. If a Russian worker's job was *automated* out from under him, he shifted to a new plant, a new job, and possibly even learned a new trade. The American worker's union, to the contrary, did its best to save the job.

Hank Kuran remembered reading, a few months earlier, of a British textile company which had attempted to introduce a whole line of new automation equipment. The unions had struck, and the company had to give up the project. What happened to the machinery? It was sold to China!

Following the orders of his underground contact, he begged out of the afternoon tour, as did half a dozen of the others. Sightseeing was as hard on the feet in Moscow as anywhere else.

After lunch he looked up Sovietska Park on his tourist map of the city. It was handy enough. A few blocks up Gorky Street.

It turned out to be typical. Well done so far as fountains, monuments and gardens were concerned. Well equipped with park benches. In the early afternoon it was by no means empty, but, on the other hand not nearly so filled as he'd noticed the parks to be the evening before.

Hank stopped at one of the numerous cold drink stands where for a few kopecks you could get raspberry syrup fizzed up with soda water. While he sipped it, a teen-ager came up beside him and said in passable English, "Excuse me, are you a tourist? Do you speak English?"

This had happened before. Another kid practicing his school language.

"That's right," Hank said.

The boy said, "You aren't a ham, are you?" He brought some cards from an inner pocket. "I'm UA3-KAR."

For a moment Hank looked at him blankly, and then he recognized the amateur radio call cards the other was displaying. "Oh, a *ham*. Well, no, but I have a cousin who is."

Two more youngsters came up. "What's his call?"

Hank didn't remember that. They all adjourned to a park bench and little though he knew about the subject, international amateur radio was discussed in detail. In fifteen minutes he was hemmed in by a dozen or so and had about decided he'd better make his excuses and circulate around making himself available to the *stilyagi* outfit. He was searching for an excuse to shake them when the one sitting next to him reverted to Russian.

"We're clear now, Henry Kuran."

Hank said, "I'll be damned. I hadn't any idea—"

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The other brushed aside trivialities. Looking at him more closely, Hank could see he was older than first estimate. Possibly twenty-two or so. Darker than most of the others, heavy-set, sharp and impatient.

"You can call me Georgi," he said. "These others will prevent outsiders from bothering us. Now then, we've been told you Americans want some assistance. What? And why should we give it to you?"

Hank said, worriedly, "Haven't you some place we could go? Where I could meet one of your higher-ups? This is important."

"Otherwise, I wouldn't be here," Georgi said impatiently. "For that matter there is no higher-up. We don't have ranks; we're a working democracy. And I'm afraid the day of the secret room in some cellar is past. With housing what it is, if there was an empty cellar in Moscow a family would move in. And remember, all buildings are State owned and operated. I'm afraid you'll have to tell your story here. Now, what is it you want?"

"I want an opportunity to meet the Galactic Confederation emissaries."

"Why?"

"To give them our side, the Western side, of the . . . well, the controversy between us and the Soviet complex. We want an opportunity to have our say before they make any permanent treaties."

Georgi considered that. "We thought it was probably something similar," he muttered. "What do you think it will accomplish?"

"At least a delaying action. If the extraterrestrials throw their weight, their scientific progress, into the balance on the side of the Soviet complex, the West will have lost the cold war. Every neutral in the world will jump on the bandwagon. International trade, sources of raw materials, will be a thing of the past. Without a shot being fired, we'd become second-rate powers overnight."

Georgi said nothing for a long moment. A new youngster had drifted up to the group but one of those on the outskirts growled something at him and he went off again. Evidently, Hank decided, all of this dozen-odd cluster of youngsters were connected with the jet-set underground.

"All right, you want us to help you in the conflict between the Soviet government and the West," Georgi said. "Why should we?"

Hank frowned at him. "You're the anti-government movement. You're revolutionists and want to overthrow the Soviet government."

The other said impatiently, "Don't read something into our organization that isn't here. We don't exist for your benefit, but our own."

"But you wish to overthrow the Soviets and establish a democratic—"

Georgi was waggling an impatient hand. "That word democratic has been so misused this past half century that it's become all but meaningless. Look here, we wish to overthrow the present Soviet government, but that doesn't mean we expect to establish one modeled to yours. We're Russians. Our problems are Russian ones.

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Most of them you aren't familiar with—any more than we're familiar with your American ones."

"However, you want to destroy the Soviets," Hank pursued.

"Yes," Georgi growled, "but that doesn't necessarily mean that we wish *you* to win this cold war, as the term goes. That is, just because we're opposed to the Soviet government doesn't mean we like yours. But you make a point. If the Galactic Confederation gives all-out support to the Soviet bureaucracy it might strengthen it to the point where they could remain in office indefinitely."

Hank pressed the advantage. "Right. You'd never overthrow them then."

"On the other hand," Georgi muttered uncomfortably, "we're not interested in giving you Americans an opportunity that would enable you to collapse the whole fabric of this country and its allies."

"Look here," Hank said. "In the States we seem to know surprisingly little about your movement. Just what *do* you expect to accomplish?"

"To make it brief, we wish to enjoy the product of the sacrifices of the past fifty years. If you recall your Marx"—he twisted his face here in wry amusement—"the idea was that the State was to wither away once Socialism was established. Instead of withering away, it has become increasingly strong. This was explained by the early Bolsheviks in a fairly reasonable manner. Socialism presupposes a highly industrialized economy. It's not possible in a primitive nor even a feudalistic society. So our Communist bureaucracy remained in the saddle through a period of transition. The task was to industrialize the Soviet countries in a matter of decades where it had taken the Capitalist nations a century or two."

Georgi shrugged. "I've never heard of a governing class giving up its once acquired power of its own accord, no matter how incompetent they might be."

Hank said, "I wouldn't call the Soviet government incompetent."

"Then you'd be wrong," the other said. "Progress has been made but often in spite of the bureaucracy, not because of it. In the early days it wasn't so obvious, but as we develop the rule of the political bureaucrat becomes increasingly a hinderance. Politicians can't operate industries and they can't supervise laboratories. To the extent our scientists and technicians are interfered with by politicians, to that extent we are held up in our progress. Surely you've heard of the Lysenko matter?"

"He was the one who evolved the anti-Mendelian theory of genetics, fifteen or twenty years ago."

"Correct," Georgi snorted. "Acquired characteristics could be handed down by heredity. It took the Academy of Agricultural Science at least a decade to dispose of him. Why? Because his theories fitted into Stalin's political beliefs." The underground spokesman snorted again.

Hank had the feeling they were drifting from the subject. "Then you

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want to overthrow the Communist bureaucracy?"

"Yes, but that is only part of the story. Overthrowing it without something to replace the bureaucracy is a negative approach. We have no interest in a return to Czarist Russia, even if that were possible, and it isn't. We want to profit by what has happened in these years of ultra-sacrifice, not to destroy everything. The day of rule by politicians is antiquated, we look forward to the future." He seemed to switch subjects. "Do you remember Djilas' book which he wrote in one of Tito's prisons, "The New Class"?"

"Vaguely. I read the reviews. It was a best seller in the States some time ago."

Georgi made with his characteristic snort. "It was a best seller here—in underground circles. At any rate, that explains much. Our bureaucracy, no matter what its ideals might have been to begin with, has developed into a new class of its own. Russia sacrifices to surpass the West—but our bureaucrats don't. In Lenin's day the commissar was paid the same as the average worker, but today we have bureaucrats as wealthy as Western millionaires."

Hank said, "Of course, these are your problems. I don't pretend to have too clear a picture of them. However, it seems to me we have a mutual enemy. Right at this moment it appears that they are to receive some support that will strengthen them. I suggest you co-operate with me in hopes they'll be thwarted."

For the first time a near smile appeared on the young Russian's face. "A ludicrous situation. We have here a Russian revolutionary organization devoted to *withering away* the Russian Communist State. To gain its ends, it co-operates with a Capitalist country's agent." His grin broadened. "I suspect that neither Nicolai Lenin nor Karl Marx ever pictured such contingencies."

Hank said, "I wouldn't know. I'm not up on my Marxism. I'm afraid that when I went to school academic circles weren't inclined in that direction." He returned the Russian's wry smile.

Which only set the other off again. "Academic circles!" he snorted. "Sterile in both our countries. All professors of economics in the Soviet countries are Marxists. On the other hand, no American professor would admit to this. Coincidence? Suppose an American teacher was a convinced Marxist. Would he openly and honestly teach his beliefs? Suppose a Russian wasn't? Would he?" Georgi slapped his knee with a heavy hand and stood up. "I'll speak to various others. We'll let you know."

Hank said, "Wait. How long is this going to take? And *can* you help me if you want to? Where are these extraterrestrials?"

Georgi looked down at him. "They're in the Kremlin, How closely guarded we don't know, but we can find out."

"The Kremlin," Hank said. "I was hoping they stayed in their own ship."

"Rumor has it that they're quar-

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tered in the *Bolshoi Kremleyski Dvorets,* the Great Kremlin Palace. We'll contact you later—perhaps." He stuck his hands in his pockets and strode away, in all appearance just one more pedestrian without anywhere in particular to go.

One of the younger boys, the ham who had first approached Hank, smiled and said, "Perhaps we can talk a bit more of radio?"

"Yeah," Hank muttered. "Swell."

The next development came sooner than Henry Kuran had expected. In fact, before the others returned from their afternoon tour of the city. Hank was sprawled in one of the king-sized easy-chairs, turning what little he had to work on over in his mind. The principal decisions to make were, first, how long to wait on the assistance of the *stilyagi,* and, if that wasn't forthcoming, what steps to take on his own. The second prospect stumped him. He hadn't the vaguest idea what he could accomplish singly.

He wasn't even sure where the space aliens were. The *Bolshoi Kremlevski Dvorets,* Georgi had said. But was that correct, and, if so, where was the *Bolshoi Kremlevski Dvorets* and how did you get into it? For that matter how did you get inside the Kremlin walls?

Under his breath he cursed Sheridan Hennessey. Why had he allowed himself to be dragooned into this? By all criteria it was the desperate clutching of a drowning man for a straw. He had no way to know, for instance, if he did reach the space emissaries, that he could even communicate with them.

He caught himself wishing he was back in Peru arguing with hesitant South Americans over the relative values of American and Soviet complex commodities—and then he laughed at himself.

There was a knock at the door.

Hank came wearily to his feet, crossed and opened it.

She still wore too much make-up, the American sweater and the flared heel shoes. And her eyes were still cool and alert. She slid past him, let her eyes go around the room quickly. "You are alone?" she said in Russian, but it was more a statement than question.

Hank closed the door behind them. He scowled at her, put a finger to his lips and then went through an involved pantomime to indicate looking for a microphone. He raised his eyebrows at her.

She laughed and shook her head. "No microphones."

"How do you know?"

"We know. We have contacts here in the hotel. If the KGB had to put microphones in the rooms of every tourist in Moscow, they'd have to increase their number by ten times. In spite of your western ideas to the contrary, it just isn't done. There are exceptions, of course, but there has to be some reason for it."

"Perhaps I'm an exception." Hank didn't like this at all. The C.I.A. men had been of the opinion that the

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KGB was once again thoroughly checking on every foreigner.

"If the KGB is already onto you, Henry Kuran, then you might as well give up. Your mission is already a failure."

"I suppose so. Will you have a chair? Can I offer you a drink? My roommate has a bottle of Stolichnaya vodka which he brought from the boat."

There was an amused light in her eyes even as she shook her head. "Your friend Paco is quite a man—so I understand. But no, I am here for business." She took one of the armchairs and Hank sank into another, opposite her.

"The committee has decided to assist you to the point they can."

"Fine." Hank leaned forward.

"Tomorrow your Progressive Tours group is to have a conducted tour of the Kremlin museum. Ivan the Great's Tower, the Cathedral of the Archangel and the Assumption Cathedral."

"In the *Kremlin*?"

She was impatient. "The Kremlin is considerably larger than most Westerners seem to realize. Originally it was the whole city. The Kremlin walls are more than two kilometers long. In them are a great deal more than just government offices. Among other things, the Kremlin has one of

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the greatest museums and probably the largest in the world."

"What I meant was, with the space emissaries there, will tours still be held?"

"They *are* being held. It would be too conspicuous to stop them even if there was any reason to." She frowned and shook her head. "Just because you will be inside the Kremlin walls doesn't mean that you will be sitting in the lap of the extraterrestrials. They are probably well guarded in the palace. We don't know to what extent."

Hank said, "Then how can you help me?"

"Only in a limited way." She pulled a folded paper from her purse. "Here is a map of the Kremlin, and here one of the Palace. Both of these date from Czarist days but such things as the general layout of the Kremlin and the *Bolshoi Kremlevski Dvorets* do not change, of course."

"Do you know where the extraterrestrials are?"

"We're not sure. The palace was built in the Seventeenth Century and was popular with various czars. It has been a museum for some time. We suspect that the Galactic Confederation delegates are housed in the *Sobstvennaya Plovina* which used to be the private apartments of Nicolas the First. It is quite definite that the conferences are being held in the *Gheorghievskaya sala;* it's the largest and most impressive room in the Kremlin.

Hank stared at the two maps feeling a degree of dismay.

She said impatiently, "We can help you more than this. One of the regular guide-guards at the facade which leads to the main entrance of the palace is a member of our group. Here are your instructions."

They spent another fifteen minutes going over the details, then she shot a quick glance at her watch and came to her feet. "Is everything clear . . . comrade?"

Hank frowned slightly at the use of the word, then understood. "I think so, and thanks . . . comrade." He, as well as she, meant the term in its original sense.

He followed her to the door but before his hand touched the knob, it opened inwardly. Paco stood there, and behind him in the corridor was Char Moore.

The girl turned to Hank quickly, reached up and kissed him on the mouth and said, in English, "Goodbye, dollink." She winked at Paco, swept past Char and was gone.

Paco looked after her appreciatively, back at Hank and said ,"Ah, ha. You are quite a dog after all, eh?"

Char Moore's face was blank. She mumbled something to the effect of, "See you later," directed seemingly to both of them, and went on to her room.

Hank said, "Damn!"

Paco closed the door behind him. "What's the matter, my friend?" he grinned. "Are you attempting to play two games at once?"

The morning tour was devoted to Red Square and the Kremlin. Im-

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mediately after breakfast they formed a column with two or three other tourist parties and were marched briskly to where Gorky Street debouched into Red Square. First destination was the mausoleum, backed against the Kremlin wall, which centered the square and served as a combined Vatican, Lhasa and Mecca of the Soviet complex. Built of dark red porphyry, it was the nearest thing to a really ultramodern building Hank had seen in Moscow.

As foreign tourists they were taken to the head of the line which already stretched around the Kremlin back into Mokhovaya Street along the western wall. A line of thousands.

Once the doors opened the line moved quickly. They filed in, two by two, down some steps, along a corridor which was suddenly cool as though refrigerated. Paco, standing next to Hank, said from the side of his mouth, "Now we know the secret of the embalming. I wonder if they're hanging on meathooks."

The line emerged suddenly into a room in the center of which were three glass chambers. The three bodies, the prophet and his two leading disciples flanking him. Lenin, Stalin, Khrushchev. On their faces, Hank decided, you could read much of their character. Lenin, the idealist and scholar. Stalin, utterly ruthless organization man. Khrushchev, energetic manager of what the first two had built.

They were in the burial room no more than two minutes, filed out by an opposite door. In the light of the square again, Paco grinned at him. "Nick and Joe didn't look so good, but Nikita is standing up pretty well."

Trailing back and forth across Red Square had its ludicrous elements. The guide pointed out this and that. But all the time his charges had their eyes glued to the spaceship, settled there at the far end of the square near St. Basil's. In a way it seemed no more alien than so much else here. Certainly no more alien to the world Hank knew than the fantastic St. Basil's Cathedral.

A spaceship from the stars, though. You still had to shake your head in effort to achieve clarity, to realize the signifiance of it. A spaceship with emissaries from a Galactic Confederation.

How simple if it had only landed in Washington, London or even Paris or Rome, instead of here.

They avoided getting very near it, although the Russians weren't being ostentatious about their guarding. There was a roped off area about the craft and twenty or so guards, not overly armed, drifting about within the enclosure. But the local citizenry was evidently well disciplined. There were no huge crowds hanging on the ropes waiting for a glimpse of the interplanetary celebrities.

Nevertheless, the Intourist guide went out of his way to avoid bringing his charges too near. They retraced their steps back to Manezhnaya Square from which they had originally started to see the mausoleum, and then turned left through Alexandrovski Sad, the Alexander Park which

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ran along the west side of the Kremlin to the Borovikski Gate, on the Moskva River side of the fortress.

Paco said, "After this tour I'm in favor of us all signing a petition that our guide be awarded a medal, *Hero of Intourist.* You realize that thus far he has lost only two of us today?"

Some of the others didn't like his levity. They were about to enter the Communist shrine and wisecracking was hardly in order. Paco Rodriquez couldn't have cared less, being Paco Rodriquez.

The *stilyagi* girl had been correct about the Kremlin being an overgrown museum. Government buildings it evidently contained, but above all it provided gold topped cathedrals, fabulous palaces converted to art galleries and displays of the jeweled wealth of yesteryear and the tombs of a dozen czars including that of Ivan the Terrible.

They trailed into the Orushezhnaya Palace, through the ornate entrance hall displaying its early arms and banners.

Paco encouraged the harassed guard happily. "You're doing fine. You've had us out for more than two hours. We started with twenty-five in this group and still have twenty-one. Par for the course. What happens to a tourist who wanders absently around in the Kremlin and turns up in the head man's office?"

The guide smiled wanly. "And over here we have the thrones of the Empress Elizabeth and Czar Paul."

Unobstrusively, Hank dropped toward the tail of the group. He spent a long time peering at two silver panthers, gifts of the first Queen Elizabeth of England to Boris Godunov. The Progressive Tours assembly passed on into the next room.

A guard, standing next to the case said, "Mr. Kuran?"

Without looking up, Hank nodded.

"Follow me, slowly."

No one from the Progressive Tours group was in sight. Hank wandered after the guard, looking into display cases as he went. Finally the other turned a corner into an empty and comparatively narrow corridor. He stopped and waited for the American.

"You're Kuran?" he asked anxiously in Russian.

"That's right."

"You're not afraid?"

"No. Let's go." Inwardly, Hank growled, *Of course I'm afraid. Do I look like a confounded hero?* What was it Sheridan Hennessey had said? This was combat, combat cold-war style, but still combat. Of course he was afraid. Had there ever in the history of combat been a participant who had gone into it unafraid?

They walked briskly along the corridor. The guard said, "You have studied your maps?"

"Yes."

"I can take you only so far without exposing myself. Then you are on your own. You must know your maps or you are lost. These old palaces ramble—"

"I know," Hank said impatiently.

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"Brief me as we go along. Just for luck."

"Very well. We leave Orushezhnaya Palace by this minor doorway. Across there, to our right, is the *Bolshoi Kremlevski Dvorets,* the Great Kremlin Palace. It's there the Central Executive Committee meets, and the Assembly. The same hall used to be the czar's throne room in the old days. On the nearer side, on the ground floor, are the *Sobstvennaya Plovina,* the former private apartments of Nicholas First. The extraterrestrials are there."

"You're sure? The others weren't sure."

"That's where they are."

"How can we get to them?"

"*We* can't. Possibly *you* can. I can take you only so far. The front entrance is strongly guarded, we are going to have to enter the Great Palace from the rear, through the Teremni Palace. You remember your maps?"

"I think so."

They strode rapidly from the museum through a major courtyard. Hank to the right and a step behind the uniformed guard.

The other was saying, "The Teremni preceded the Great Palace. One of its walls was used to become the rear of the later structure. We can enter it fairly freely.

They entered through another smaller doorway a hundred feet or more from the main entrance, climbed a short marble stairway and turned right down an ornate corridor, tapestry hung. They passed occasionally other uniformed guards none of whom paid them any attention.

They passed through three joined rooms, each heavily furnished in Seventeenth Century style, each thick with icons. The guide brought them up abruptly at a small door.

He said, an air almost of defiance in his tone, "I go no further. Through this door and you are in the Great Palace, in the bathroom of the apartments of Catherine Second. You remember your maps?"

"Yes," Hank said.

"I hope so." The guard hesitated. "You are armed?"

"No. We were afraid that my things might be thoroughly searched. Had a gun been found on me, my mission would have been over then and there."

The guard produced a heavy military revolver, offered it butt foremost.

But Hank shook his head. "Thanks. But if it comes to the point where I'd need a gun—I've already failed. I'm here to talk, not to shoot."

The guard nodded. "Perhaps you're right. Now, I repeat. On the other side of this door is the bathroom of the Czarina's apartments. Beyond it is her *paradnaya divannaya,* her dressing room and beyond that the *Ekaterininskaya sala,* the throne room of Catherine Second. It is probable that there will be nobody in any of these rooms. Beyond that, I do not know."

He ended abruptly with, "Good luck," turned and scurried away.

"Thanks," Hank Kuran said after him. He turned and tried the door-

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knob. Inwardly he thought, *All right Henry Kuran. Hennessey said you had a reputation for being able to think on your feet. Start thinking. Thus far all you've been called on to do is exchange low-level banter with a bevy of pro-commie critics of the United States. Now the chips are down.*

The apartments of the long dead czarina were empty. He pushed through them and into the corridor beyond.

And came to a quick halt.

Halfway down the hall, Loo Motlamelle crouched over a uniformed, crumpled body. He looked up at Hank Kuran's approach, startled, a fighting man at bay. His lips thinned back over his teeth. A black thumb did something to the weapon he held in his hand.

Hank said throatily, "Is he dead?"

Loo shook his head, his eyes coldly wary. "No. I slugged him."

Hank said, "What are you doing here?"

Loo came erect. "It occurs to me that I'm evidently doing the same thing you are."

But the dull metal gun in his hand was negligently at the ready and his eyes were cold, cold. It came to Hank that banjos on the levee were very far away.

This lithe fighting man said tightly, "You know where we are? Exactly where we are? I'm not sure."

Hank said, "In the hall outside the *Sobstvennaya Plovina* of the *Bolshoi Kremlevski Dvorets*. The czar's private apartments. And how did you get here?"

"The hard way," Loo said softly. His eyes darted up and down the corridor. "I can't figure out why there aren't more guards. I don't like this. You're armed?"

"No," Hank said.

Loo grinned down at his own weapon. "One of us is probably making a mistake but we both seem to have gotten this far. By the way, I'm Inter-Commonwealth Security. You're C.I.A., aren't you? Talk fast, Hank, we're either a team from now on, or I've got to do something about you."

"Special mission for the President," Hank said. "Why didn't we spot each other sooner?"

Loo grinned again in deprecation. "Evidently because we're both good operatives. If I've got this right, the extraterrestrials are somewhere in here."

Hank started down the corridor. There was no time to go into the whys and wherefores of Loo's mission. It must be approximately the same as his own. "There are some private apartments in this direction," he said over his shoulder. "They must be quartered—"

A door off the corridor opened and a tall, thin, ludicrously garbed man—

Hank pulled himself up quickly, both mentally and physically. It was no man. It was almost a man—but no.

Loo's weapon was already at the alert.

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The newcomer unhurriedly looked from one of them to the other. Then down at the Russian guard sprawled on the floor behind them.

He said in Russian, "Always violence. The sadness of violence. When faced with crisis, threaten violence if outpointed. Your race has much to learn." He switched to English. "But this is probably your language, isn't it?"

Loo gaped at him. The man from space was almost as dark complected as the Negro.

The extraterrestrial stepped to one side and indicate the room behind him "Please enter. I assume you've come looking for us."

They entered the ornate bedroom.

The extraterrestrial said, "Is the man dead?"

Loo said, "No. Merely stunned."

"He needs no assistance?"

"Nothing could help him for half an hour or more. Then he'll probably have a severe headache."

The extraterrestrial had even the ability to achieve a dry quality in his voice. "I am surprised at your forebearance." He took a chair before a baroque desk. "Undoubtedly you have gone through a great deal to penetrate to this point. I am a member of the interplanetary delegation. What is it that you want?"

Hank looked at Loo, received a slight nod, and went into his speech. The space alien made no attempt to interrupt.

When Hank had finished, the extraterrestrial turned his eyes to Loo. "And you?"

Loo said, "I represent the British Commonwealth rather than the United States, but my purpose in contacting you was identical. Her Majesty's government is anxious to consult with you before you make any binding agreements with the Soviet complex."

The alien turned his eyes from one to the other. His face, Hank decided, had a Lincolnesque quality, so ugly as to be beautiful in its infinite sadness.

"You must think us incredibly naive," he said.

Hank scowled. He had adjusted quickly to the space ambassador's *otherness,* both of dress and physical qualities, but there was an irritating something— He put his finger on it. He felt as he had, some decades ago, when brought before his grammar school principal for an infraction of school discipline.

Hank said, "We haven't had too much time to think. We've been desperate."

The alien said, "You have gone to considerable trouble. I can even admire your resolution. You will be interested to know that tomorrow we take ship to Peiping."

"Peiping?" Loo said blankly.

"Following two weeks there we proceed to Washington and following that to London. What led your governments to believe that the Soviet nations were to receive all our attention, and your own none at all?"

Hank blurted, "But you landed *here.* You made no contact with us."

"The size of our expedition is

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limited. We could hardly do everything at once. The Soviet complex, as you call it, is the largest government and the most advanced on Earth. Obviously, this was our first stop." His eyes went to Hank's. "You're an American. Do you know why you have fallen behind in the march of progress?"

"I'm not sure we have," Hank said flatly. "Do you mean in comparison with the Soviet complex?"

"Exactly. And if you don't realize it, then you've blinded yourself. You've fallen behind in a score of fields because a decade or so ago, in your years between 1957 and 1960, you made a disastrous decision. In alarm at Russian progress, you adopted a campaign of combating Russian science. You began educating your young people to combat Russian progress."

"We had to!"

The alien grunted. "To the contrary, what you should have done was try to excel Russian science, technology and industry. Had you done that you might have continued to be the world's leading nation, until, at least, some sort of world unity had been achieved. By deciding to *combat* Russian progress you became a retarding force, a deliberate drag on the development of your species, seeking to cripple and restrain rather than to grow and develop. The way to win a race is not to trip up your opponent, but to run faster and harder than he."

Hank stared at him.

The space alien came to his feet. "I am busy. Your missions, I assume, have been successfully completed. You have seen one of our group. Melodramatically, you have warned us against your enemy. Your superiors should be gratified. And now I shall summon a guide to return you to your hotels."

A great deal went out of Hank Kuran. Until now the tenseness had been greater than he had ever remembered in life. Now he was limp. In response, he nodded.

Loo sighed, returned the weapon which he had until now held in his hand to a shoulder holster. "Yes," he said, meaninglessly. He turned and looked at Hank Kuran wryly. "I have spent the better part of my life learning to be an ultra-efficient security operative. I suspect that my job has just become obsolete."

"I have an idea that perhaps mine is too," Hank said.

In the morning, the Progressive Tours group was scheduled to visit a co-operative farm, specializing in poultry, on the outskirts of Moscow. While the bus was loading Hank stopped off at the Grand Hotel's Intourist desk.

"Can I send a cable to the United States?"

The chipper Intourist girl said, "But of course." She handed him a form.

He wrote quickly:

SHERIDAN HENNESSEY
WASHINGTON, D. C.
MISSION ACCOMPLISHED

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MORE SATISFACTORILY THAN EXPECTED.

HENRY KURAN

The girl checked it quickly. "But your name is Henry Stevenson."

"That," Hank said, "was back when I was a cloak and dagger man."

She blinked and looked after him as he walked out and climbed aboard the tourist bus. He found an empty seat next to Char Moore and settled into it.

Char said evenly, "Ah, today you have time from your amorous pursuits to join the rest of us."

He raised an eyebrow at her. Jealousy? His chances were evidently better than he had ever suspected. "I meant to tell you about that," he said, "the first time we're by ourselves."

"Hm-m-m," she said. Then, "We've been in Russia for several days now. What do you think of it?"

Hank said, "I think it's pretty good. And I have a sneaking suspicion that in another ten years, when a few changes will have evolved, she'll be better still."

She looked at him blankly. "You *do*? Frankly, I've been somewhat disappointed."

"Sure. But wait'll you see *our* country in ten years. You know, Char, this world of ours has just got started."

THE END

IN TIMES TO COME

Tracking down a spy is a tough job—and a telepathic spy is, of course, tougher—but it's at least something definite. Teleporting JDs were worse; even when you catch them, they vanish. But Kenneth Malone, of the "Queen's Own FBI," hit a tougher one.

Is it a crime to joggle someone's mental elbow, so that he makes some simple—but utterly disastrous—mistake? Is it illegal to distract someone's attention—and can you prove it has even actually happened. If the racketeer makes a slight mistake and sends his secret set of books to the District Attorney—is this evidence of a crime against the said racketeer? And should the FBI try to catch and stop the causer of such mistakes?

But it ceases to be so funny, when these slips become the "Occasion For Disaster" that is destroying all civilization . . .

After all, it takes only a little energy to destroy a great machine! Mark Phillips, next month, starts telling how the little frictions of life can destroy a world . . .

THE EDITOR.

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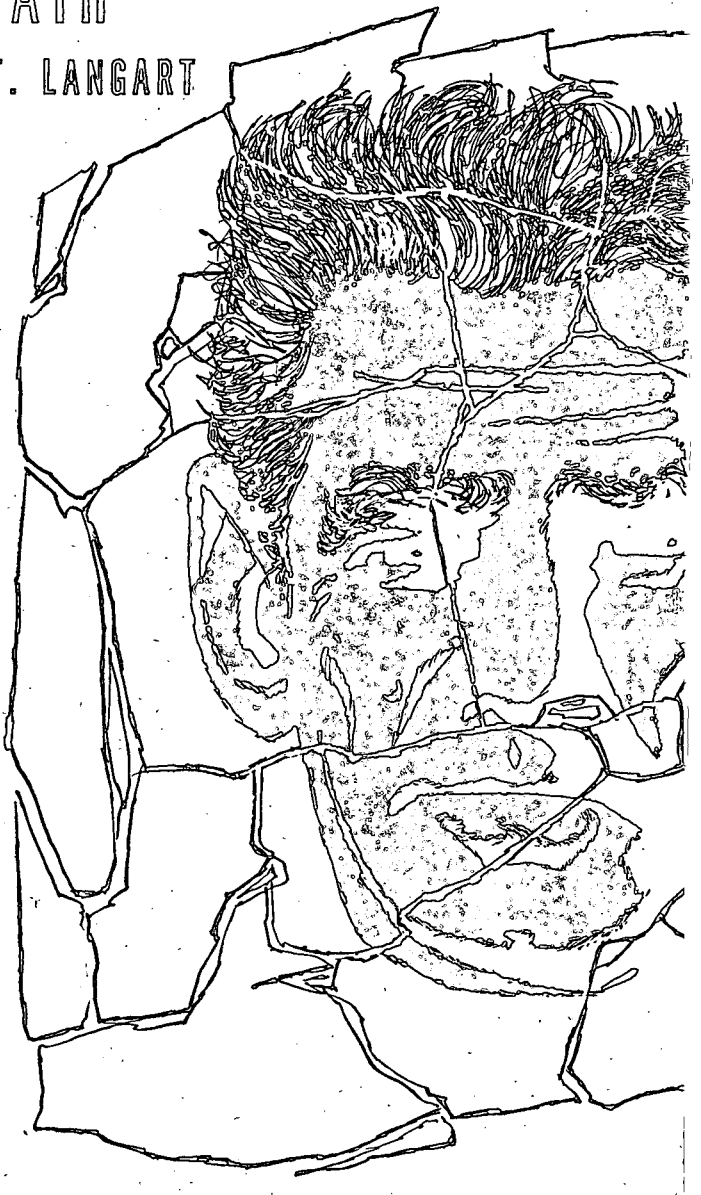
PSICHOPATH

By DARREL T. LANGART



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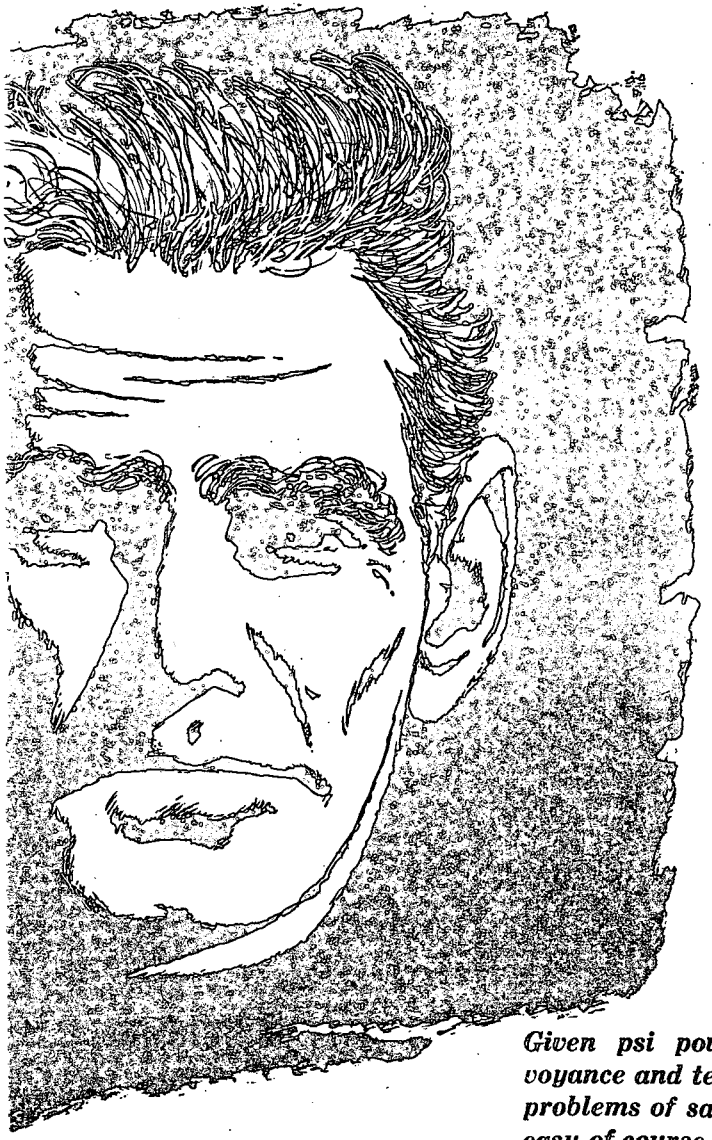

Given psi powers like clairvoyance and telepathy, solving problems of sabotage would be easy, of course. That is, it seems that way at first thought!

Illustrated by van Dongen

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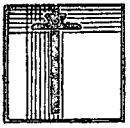

HE man in the pastel blue topcoat walked with steady purpose, but without haste, through the chill, wind-swirled drizzle that filled the air above the streets of Arlington, Virginia. His matching blue cap-hood was pulled low over his forehead, and the clear, infrared radiating face mask had been flipped down to protect his chubby cheeks and round nose from the icy wind.

No one noticed him particularly. He was just another average man who blended in with all the others who walked the streets that day. No one recognized him; his face did not appear often in public places, except in his own state, and, even so, it was a thoroughly ordinary face. But, as he walked, Senator John Peter Gonzales was keeping a mental, fine-webbed, four-dimensional net around him, feeling for the slightest touch of recognition. He wanted no one to connect him in any way with his intended destination.

It was not his first visit to the six-floor brick building that stood on a street in a lower-middle-class district of Arlington. Actually, government business took him there more often than would have been safe for the average man-on-the-street. For Senator Gonzales, the process of remaining incognito was so elementary that it was almost subconscious.

Arriving at his destination, he paused on the sidewalk to light a cigarette, shielding it against the wind and drizzle with cupped hands while his mind made one last check on the surroundings. Then he strode quickly up the five steps to the double doors which were marked: *The Society For Mystical And Metaphysical Research, Inc.*

Just as he stepped in, he flipped the face shield up and put on an old-fashioned pair of thick-lensed, black-rimmed spectacles. Then, his face assuming a bland smile that would have been completely out of place on Senator Gonzales, he went from the foyer into the front office.

"Good afternoon, Mrs. Jesser," he said, in a high, smooth, slightly accented voice that was not his own. "I perceive by your aura that you are feeling well. Your normal aura-color is tinged with a positive golden hue."

Mrs. Jesser, a well-rounded matron in her early forties, rose to the bait like a porpoise being hand-fed at a Florida zoo. "*Dear* Swami Chandra! How perfectly *won*derful to see you again! You're looking *very* well your*self*."

The Swami, whose Indian blood was of the Aztec rather than the Brahmin variety, nonetheless managed to radiate all the mystery of the East. "My well-being, dear Mrs. Jesser, is due to the fact that I have been communing for the past three months with my very good friend, the Fifth Dalai Lama. A most refreshingly wise person." Senator Gonzales was fond of the Society's crackpot receptionist, and he knew exactly what kind of hokum would please her most.

"Oh, I *do* hope you will find time

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to tell me *all* about it," she said effusively. "Mr. Balfour isn't in the city just now," she went on. "He's lecturing in New York on the history of flying saucer sightings. Do you realize that this is the fortieth anniversary of the first saucer sighting, back in 1944?"

"The first *photographed* sighting," the Swami corrected condescendingly. "Our friends have been watching and guiding us for far longer than that, and were sighted many times before they were photographed."

Mrs. Jesser nodded briskly. "Of course. You're right, as always, Swami."

"I am sorry to hear," the Swami continued smoothly, "that I will not be able to see Mr. Balfour. However, I came at the call of Mr. Brian Taggert, who is expecting me."

Mrs. Jesser glanced down at her appointment sheet. "He didn't mention an appointment to me. However—" She punched a button on the intercom. "Mr. Taggert? Swami Chandra is here to see you. He says he has an appointment."

Brian Taggert's deep voice came over the instrument. "The Swami, as usual, is very astute. I have been thinking about calling him. Send him right up."

"You may go up, Swami," said Mrs. Jesser, wide-eyed. She watched in awe as the Swami marched regally through the inner door and began to climb the stairs toward the sixth floor.

One way to hide an ex-officio agency of the United States Government was to label it truthfully—*The Society For Mystical And Metaphysical Research.* In spite of the fact that the label was literally true, it sounded so crackpot that no one but a crackpot would bother to look into it. As a consequence, better than ninety per cent of the membership of the Society was composed of just such people. Only a few members of the "core" knew the organization's true function and purpose. And as long as such scatterbrains as Mrs. Jesser and Mr. Balfour were in there pitching, no one would ever penetrate to the actual core of the Society.

The senator had already pocketed the exaggerated glasses by the time he reached the sixth floor, and his face had lost its bland, overly-wise smile. He pushed open the door to Taggert's office.

"Have you got any ideas yet?" he asked quickly.

Brian Taggert, a heavily-muscled man with dark eyes and black, slightly wavy hair, sat on the edge of a couch in one corner of the room. His desk across the room was there for paperwork only, and Taggert had precious little of that to bother with.

He took a puff from his heavy-bowled briar. "We're going to have to send an agent in there. Someone who can be on the spot. Someone who can get the feel of the situation first hand."

"That'll be difficult. We can't just suddenly stick an unknown in there and have an excuse for his

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being there. Couldn't Donahue or Reeves—"

Taggert shook his head. "Impossible, John. Extrasensory perception can't replace sight, any more than sight can replace hearing. You know that."

"Certainly. But I thought we could get enough information that way to tell us who our saboteur is. No dice, eh?"

"No dice," said Taggert. "Look at the situation we've got there. The purpose of the Redford Research Team is to test the Meson Ultimate Decay Theory of Dr. Theodore Nordred. Now, if we—"

Senator Gonzales, walking across the room toward Taggert, gestured with one hand. "I know! I know! Give me *some* credit for intelligence! But we *do* have one suspect, don't we? What about *him?*"

Taggert chuckled through a wreath of smoke. "Calm down, John. Or are you trying to give me your impression of Mrs. Jesser in a conversation with a saucerite?"

The senator laughed and sat down in a nearby chair. "All right. Sorry. But this whole thing is lousing up our entire space program. First off, we nearly lose Dr. Ch'ien, and, with him gone, the interstellar drive project would've been shot. Now, if this sabotage keeps up, the Redford project *will* be shot, and that means we might have to stick to the old-fashioned rocket to get off-planet. Brian, we *need* antigravity, and, so far, Nordred's theory is our only clue."

"Agreed," said Taggert.

"Well, we're never going to get it if equipment keeps mysteriously burning itself out, breaking down, and just generally goofing up. This morning, the primary exciter on the new ultracosmotron went haywire, and the beam of sodium nuclei burned through part of the accelerator tube wall. It'll take a month to get it back in working order."

Taggert took his pipe out of his mouth and tapped the dottle into a nearby ash disposal unit. "And you want to pick up our pet spy?"

Senator Gonzales scowled. "Well, I'd certainly call him our prime suspect." But there was a certain lack of conviction in his manner.

Brian Taggert didn't flatly contradict the senator. "Maybe. But, you know, John, there's one thing that bothers me about these accidents."

"What's that?"

"The fact that we have not one shred of evidence that points to sabotage."

In a room on the fifth floor, directly below Brian Taggert's office, a young man was half sitting, half reclining in a thickly upholstered adjustable chair. He had dropped the back of the chair to a forty-five degree angle and lifted up the footrest; now he was leaning back in lazy comfort, his ankles crossed, his right hand holding a slowly smoldering cigarette, his eyes contemplating the ceiling. Or, rather, they seemed to be contemplating something *beyond* the ceiling.

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It was pure coincidence that the focus of his thoughts happened to be located in about the same volume of space that his eyes seemed to be focused on. If Brian Taggert and Senator Gonzales had been in the room below, his eyes would still be looking at the ceiling.

In repose, his face looked even younger than his twenty-eight years would have led one to expect. His close-cropped brown hair added to the impression of youth, and the well-tailored suit on his slim, muscular body added to the effect. At any top-flight university, he could have passed for a well-bred, sophisticated, intelligent student who had money enough to indulge himself and sense enough not to overdo it.

He was beginning to understand the pattern that was being woven in the room above—beginning to feel it in depth.

Senator Gonzales was mildly telepathic, inasmuch as he could pick up thoughts in the prevocal stage—the stage at which thought becomes definitely organized into words, phrases, and sentences. He could go a little deeper, into the selectivity stage, where the linking processes of logic took over from the nonlogical but rational processes of the preconscious—but only if he knew the person well. Where the senator excelled was in detecting emotional tone and manipulating emotional processes, both within himself and within others.

Brian Taggert was an analyzer, an originator, a motivator—and more. The young man found himself avoiding too deep a probe into the mind of Brian Taggert; he knew that he had not yet achieved the maturity to understand the multilayered depths of a mind like that. Eventually, perhaps . . .

Not that Senator Gonzales was a child, nor that he was emotionally or intellectually shallow. It was merely that he was not of Taggert's caliber.

The young man absently took another drag from his cigarette. Taggert had explained the basic problem to him, but he was getting a wider picture from the additional information that Senator Gonzales had brought.

Dr. Theodore Nordred, a mathematical physicist and one of the top-flight, high-powered, original minds in the field, had shown that Einstein's final equations only held in a universe composed entirely of normal matter. Since the great Einstein had died before the Principle of Parity had been overthrown in the mid-fifties, he had been unable to incorporate the information into his Unified Field Theory. Nordred had been able to show, mathematically, that Einstein's equations were valid only for a completely "dexter," or right-handed universe, or for a completely "sinister" or left-handed universe.

Although the universe in which Man lived was predominantly dexter—arbitrarily so designated—it was not completely so. It had a "sinister" component amounting to approximately one one-hundred-thousandth

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of one per cent. On the average, one atom out of every ten million in the universe was an atom of antimatter. The distribution was unequal of course; antimatter could not exist in contact with ordinary matter. Most of it was distributed throughout interstellar space in the form of individual atoms, freely floating in space, a long way from any large mass of normal matter.

But that minute fraction of a per cent was enough to show that the known universe was not totally Einsteinian. In a purely Einsteinian universe, antigravity was impossible, but if the equations of Dr. Theodore Nordred were actually a closer approximation to true reality than those of Einstein, then antigravity *might* be a practical reality.

And that was the problem the Redford Research Team was working on. It was a parallel project to the interstellar drive problem, being carried on elsewhere.

The "pet spy," as Taggert had called him, was Dr. Konrad Bern, a middle-aged Negro from Tanganyika, who was convinced that only under Communism could the colored races of the world achieve the technological organization and living standard of the white man. He had been trained as a "sleeper"; not even the exhaustive investigations of the FBI had turned up any relationship between Bern and the Soviets. It had taken the telepathic probing of the S.M.M.R. agents to uncover his real purposes. Known, he constituted no danger.

There was no denying that he was a highly competent, if not brilliant, physicist. And, since it was quite impossible for him to get any information on the Redford Project into the hands of the opposition—it was no longer fashionable to call Communists "the enemy"—there was no reason why he shouldn't be allowed to contribute to the American efforts to bridge space.

Three times in the five months since Bern had joined the project, agents of the Soviet government had made attempts to contact the physicist. Three times the FBI, warned by S.M.M.R. agents, had quietly blocked the contact. Konrad Bern had been effectively isolated.

But, at the project site itself, equipment failure had become increasingly more frequent, all out of proportion to the normal accident rate in any well-regulated laboratory. The work of the project had practically come to a standstill; the ultra-secret progress reports to the President were beginning to show less and less progress in the basic research, and more and more progress *in repairing damaged equipment.* Apparently, though, increasing efficiency in repair work was self-neutralizing; repairing an instrument in half the time merely meant that it could break down twice as often.

It had to be sabotage. And yet, not even the S.M.M.R. agents could find any trace of intentional damage

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nor any thought patterns that would indicate deliberate damage.

And Senator John Peter Gonzales quite evidently did *not* want to face the implications of *that* particular fact.

"We're going to have to send an agent in," Taggert repeated.

(*That's my cue,* thought the young man on the fifth floor as he crushed out his cigarette and got up from the chair.)

"I don't know how we're going to manage it," said the senator. "What excuse do we have for putting a new man on the Redford team?"

Brian Taggert grinned. "What they need is an expert repair technician—a man who knows how to build and repair complex research instruments. He doesn't have to know anything about the purpose of the team itself, all he has to do is keep the equipment in good shape."

Senator Gonzales let a slow smile spread over his face. "You've been gulling me, you snake. All right; I deserved it. Tell him to come in."

As the door opened, Taggert said: "Senator Gonzales, may I present Mr. David MacHeath? He's our man, I think."

David MacHeath watched a blue line wriggle its way erratically across the face of an oscilloscope. "The wave form is way off," he said flatly, "and the frequency is slithering all over the place."

He squinted at the line for a moment, then spoke to the man standing nearby. "Signal Harry to back her off two degrees, then run her up slowly, ten minutes at a time."

The other man flicked the key on the side of the small carbide-Welsbach lamp. The shutters blinked, sending pulses of light down the length of the ten-foot diameter glass-walled tube in which the men were working. Far down the tube, MacHeath could see the answering flicker from Harry, a mile and a half away in the darkness.

MacHeath watched the screen again. After a few seconds, he said: "O.K.! Hold it!"

Again the lamp flashed.

"Well, it isn't perfect," MacHeath said, "but it's all we can do from here. We'll have to evacuate the tube to get her in perfect balance. Tell Harry to knock off for the day."

While the welcome message was being flashed, MacHeath shut off the testing instruments and disconnected them. It was possible to compensate a little for the testing equipment, but a telephone, or even an electric flashlight, would simply add to the burden.

Bill Griffin shoved down the key on the lamp he was holding and locked it into place. The shutters remained open, and the lamp shed a beam of white light along the shining walls of the cylindrical tube. "How much longer do you figure it'll take, Dave?" he asked.

"Another shift, at least," said MacHeath, picking up the compact, shielded instrument case. "You want to carry that mat?"

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Griffin picked up the thick sponge-rubber mat that the instrument case had been sitting on, and the two men started off down the tube, walking silently on sponge-rubber-soled shoes which would not scratch the glass underfoot.

"Any indication yet as to who our saboteur is?" Griffin asked.

"I'm not sure," MacHeath admitted. "I've picked up a couple of leads, but I don't know if they mean anything or not."

"I wonder if there *is* a saboteur," Griffin said musingly. "Maybe it's just a run of bad luck. It could happen, you know. A statistical run of—"

"You don't believe that, any more than I do," MacHeath said.

"No. But I find it even harder to believe that a materialistic philosophy like Communism could evolve any workable psionic discipline."

"So do I," agreed MacHeath.

"But it can't be physical sabotage," Griffin argued. "There's not a trace of it—anywhere. It *has* to be psionic."

"Right," said MacHeath, grinning as he saw what was coming next.

"But we've already eliminated that. So?" Griffin nodded firmly as if in full agreement with himself. "So we follow the dictum of the Master: 'Eliminate the impossible; whatever is left, no matter how improbable, is the truth.' And, since there is absolutely nothing left, there is no truth. At the bottom, the whole thing is merely a matter of mental delusion."

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"Sherlock Holmes would be proud of you, Bill," MacHeath said. "And so am I."

Griffin looked at MacHeath oddly. "I wish I was a halfway decent telepath. I'd like to know what's going on in your preconscious."

"You'd have to dig deeper than that, I'm afraid," MacHeath said ruefully. "As soon as my subconscious has solved the problem, I'll let you know."

"I've changed my mind," said Griffin cheerfully. "I don't envy your telepathy. I don't envy a guy who has to TP his own subconscious to find out what he's thinking."

MacHeath chuckled softly as he turned the bolt that opened the door in the "gun" end of the stripped-nuclei accelerator. The seals broke with a soft hiss. Evidently, the barometric pressure outside the two-mile-long underground tube had changed slightly during the time they had been down there.

"It'll be a week before we can test it," MacHeath said in a tired voice. "Even after we get it partly in balance. It'll take that long to evacuate the tube and sweep it clean."

It was the first sentence he had spoken in the past hour or so, and it was purely for the edification of the man who was standing on the other side of the air lock, although neither Griffin nor MacHeath had actually seen him as yet.

Griffin was not a telepath in the sense that the S.M.M.R used the word, but to a non-psionicist, he would have appeared to be one. Membership in the "core" group of the *Society for Mystical and Metaphysical Research* required, above all, *understanding*. And, with that understanding, a conversation between two members need consist only of an occasional gesture and a key word now and then.

The word "understanding" needs emphasis. Without understanding of another human mind, no human mind can be completely effective. Without that understanding, no human being can be completely free.

And yet, the English word "understanding" is only an approximation to the actual process that must take place. *Total* understanding, in one sense, would require that a person actually *become* another person —that he be able to feel, completely and absolutely, every emotion, every thought, every bodily sensation, every twinge of memory, every judgment, every decision, and every sense of personal identity that is felt by the other person, no more and no less.

Such totality is, obviously, neither attainable nor desirable. The result would be a merger of identities, a total unification. And, as a consequence, a complete loss of one of the human beings involved.

Optimum "understanding" requires that a judgment be made, and that, in turn, requires *two* minds—not a fusion of identity. There must be one to judge and another to be judged, and each mind plays both roles.

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Love thy neighbor as thyself. But the original Greek word would translate better as "respect and understand" than as the modern English "love." The founders of our modern religions were not fools; they simply did not have the tools at hand to formulate their knowledge properly. As understanding increases, a critical point is reached, which causes a qualitative change in the human mind.

First, self-understanding must come. The human mind operates through similarities, and the thing most similar to any human mind is itself. The next most similar thing is another human mind.

From that point on, all objects, processes, and patterns in the universe can be graded according to their similarity to each other, and, ultimately, to their similarity to the human mind.

Two given entities may seem utterly dissimilar, but they can always be linked by a *tertium quid*—a "third thing" which is similar to both. This third thing, be it a material object or a product of the human imagination, is called a symbol. Symbols are the bridges by which the human mind can reach and manipulate the universe in which it exists. With the proper symbols and the understanding to use them, the human mind is limited only by its own inherent structural restrictions.

One of the most active research projects of the S.M.M.R. was the construction of a more powerful symbology. Psionics had made tremendous strides in the previous four decades, but it was still in the alchemy stage. So far, symbols for various processes could only be worked out by cut-and-try, rule-of-thumb methods, using symbols already established, including languages and mathematics. None were completely satisfactory, but they worked fairly well within their narrow limits.

As far as communication was concerned, the hashed-together symbology used by the S.M.M.R. was better than any conceivable code. The understanding required to "break" the "code" was well beyond the critical point. Anyone who could break it was, *ipso facto,* a member of the S.M.M.R.

Most people didn't even realize that a conversation was taking place between two members, especially if a "cover conversation" was used at the same time.

MacHeath's verbal discussion of the testing of the nuclei accelerator was just such a cover. Even before he had cracked the air lock, he had known that Dr. Theodore Nordred was standing on the other side of the thick wall.

MacHeath pushed the heavy door open on its smooth hinges. "Oh, hello, Dr. Nordred. How's everything?"

The heavy-set mathematician smiled pleasantly as MacHeath and Griffin came into the gun chamber. "I just thought I'd come down and see how you were getting along," he said. His voice was a low tenor,

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with just a touch of Midwestern twang. "Sometimes the creative mind gets bogged down in *n*th-order abstractions that have no discernible connection with anything at all." He chuckled. "When that happens, I drop everything and go out to find something mundane to worry about."

Nordred was only an inch shorter than the slim MacHeath, and he weighed in at close to two hundred pounds. At twenty-five, he had had the build of a lightweight wrestler; thirty more years had added poundage—a roll beneath the chin and a bulge at the belly—but he still looked capable of going a round or two without tiring. His shock of heavy hair was a mixture of mouse-brown and gray, and it seemed to have a tendency to stand up on end, which added another inch and a half to his height. His round face had a tendency to smile when he was talking or working with his hands; when he was deep in thought, his face usually relaxed into thoughtful blankness. He frowned rarely, and only for seconds at a time.

"It seems to me you have enough to worry about, doctor," MacHeath said banteringly, "without looking for it." He put down his instrument case and took out a cigarette while Griffin closed the door to the acceleration tube.

"Oh, I don't have to look far," Nordred said. "How long do you think it will be before we can resume our work with the Monster?"

"Ten days to two weeks," MacHeath said promptly.

"I see." One of his rare frowns crossed his face. "I wish I knew why the exciter arced across. It shouldn't have."

"Don't you have any idea?" MacHeath asked innocently. At the same time, he opened his mind wide to net in every wisp and filament of Nordred's thoughts that he could reach.

"None at all," admitted the mathematician. "Weakness in the insulation, I suppose, though it tested solidly enough." And his mind, as far back as his preconscious and the upper fringes of his subconscious, agreed with his words. MacHeath could go no deeper as yet; he didn't know Nordred well enough yet.

There were suspicions in Nordred's mind that the insulation weakness must have been caused by deliberate sabotage, but he had no one to pin his suspicions on. Neither he nor anyone else connected with the Redford project was aware of the true status of Dr. Konrad Bern.

"Well, let's hope it doesn't happen again," MacHeath said. "Balancing these babies so that they work properly is hard enough for a deuteron accelerator, but the Monster here is ten times as touchy."

Nordred nodded absently. "I know. But our work can't be done with anything less." Nordred actually knew less about the engineering details of the big accelerator than anyone else on the project; he was primarily a philosopher-mathematician, and only secondarily a physicist. He was theoretically in charge of the

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project, but the actual experimentation was done by the other four men: Drs. Roger Kent, Paul Luvochek, Solomon Bessermann, and Konrad Bern. These four and their assistants set up and ran off the experiments designed to test Dr. Nordred's theories.

MacHeath picked up his instrument case again, and the three men went out of the gun chamber, into the outer room, and then started up the spiral stairway that led to the surface, talking as they went. But the apparent conversation had little to do with the instructions that MacHeath was giving Griffin as they climbed.

So when MacHeath stopped suddenly and patted at his coverall pockets, Griffin was ready for the words that came next.

"Damn!" MacHeath said. "I've left my notebook. Will you go down and get it for me, Bill?"

Dr. Nordred had neither understood nor noticed the actual instructions:

"Bill, as soon as I give you an excuse, get back down there and check that gun chamber. Give it a thorough going-over. I don't really think you'll find a thing, but I don't want to take any chances at this stage of the game."

"Right," said Griffin, starting back down the stairway.

MacHeath and Dr. Nordred went on climbing.

David MacHeath sat at a table in the project's cafeteria, absently stirring his coffee, and trying to look professionally modest while Dr. Luvochek and Dr. Bessermann alternately praised him for his work.

Luvochek, a tubby little butterball of a man, whose cherubic face would have made him look almost childlike if it weren't for the blue of his jaw, said: "You and those two men of yours have really done a marvelous job in the past four days, Mr. MacHeath—really marvelous."

"I'll say," Bessermann chimed in. "I was getting pretty tired of looking at burned-out equipment and spending three-quarters of my time putting in replacement parts and wielding a soldering gun." Besserman was leaner than Luvochek, but, like his brother scientist, he was balding on top. Both men were in their middle thirties.

"I don't understand this jinx, myself," Luvochek said. "At first, it was just little things, but the accidents got worse and worse. And then, when the Monster blew—" He stopped and shook his head slowly. "I'd suspect sabotage, except that there was never any sign of tampering with the equipment I saw."

"What do *you* think of the sabotage idea?" Bessermann asked MacHeath.

MacHeath shrugged. "Haven't seen any signs of it."

"Run of bad luck," said Luvochek. "That's all."

As they talked MacHeath absorbed the patterns of thought that wove in and out in the two men's minds. Both men were more open than Dr. Nor-

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dred; they were easier for MacHeath to understand. Nowhere was there any thought of guilt—at least, as far as sabotage was concerned.

MacHeath drank his coffee slowly and thoughtfully, keeping up his part of the three-way conversation while he concentrated on his own problem.

One thing was certain: Nowhere in the minds of any of the personnel of the Redford Project was there any conscious knowledge of sabotage. Not even in the mind of Konrad Bern.

Dr. Roger Kent, a tall, lantern-jawed, sad-eyed man in his forties, had been hard to get through to at first, but as soon as MacHeath discovered that the hard block Kent had built up around himself was caused by grief over a wife who had been dead five years, he became as easy to read as a billboard. Kent had submerged his grief in work; the eternal drive of the true scientist to drag the truth out of Mother Nature. He was constitutionally incapable of sabotaging the very instruments that had been built to dig in after that truth.

Dr. Konrad Bern, on the other hand, was difficult to read below the preconscious stage. Science, to him, was a form of power, to be used for "idealistic" purposes. He was perfectly capable of sabotaging the weapons of an enemy if it became necessary, whether that meant ruining a physical instrument or carefully falsifying the results of an experiment. Outwardly, he was a pleasant enough chap, but his mind revealed a rigidly held pattern of hatreds, fears, and twisted idealism. He held them tightly against the onslaughts of a hostile world.

And that meant that he couldn't possibly have any control over whatever psionic powers he may have had.

Unless—

Unless he was so expert and so well-trained that he was better than anything the S.M.M.R. had ever known.

MacHeath didn't even like to think about that. It would mean that all the theory of psionics that had been built up so painstakingly over the past years would have to be junked *in toto*.

Something was gnawing in the depths of his mind. In the perfectly rational but utterly nonlogical part of his subconscious where hunches are built, something was trying to form.

MacHeath didn't try to probe for it. As soon as he had enough information for the hunch to be fully formed, it would be ready to use. Until then, it would be worthless, and probing for it might interrupt the formation.

He was just finishing his coffee as Bill Griffin came in the door and headed toward the table where MacHeath, Luvochek, and Bessermann were sitting.

MacHeath stood up and said: "Excuse me. I'll have to be getting some work done if you guys are ever go-

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ing to get your own work done."

"Sure."

"Go ahead."

"Thanks for the coffee," MacHeath added as he moved away.

"Anytime," said Bessermann, grinning. "You guys just keep up the good work. When you fix 'em, they stay fixed. We haven't had a burnout since you came."

"Maybe you broke our statistical jinx," said Luvochek, with a chubby smile.

"Maybe," said MacHeath. "I hope so."

For some reason, the gnawing in his hunch factory became more persistent.

As he and Griffin walked toward the door, Griffin reported rapidly. "I checked everything in the gun chamber. No sign of any tampering. Everything's just as we left it. The dust film hasn't been disturbed."

"It figures," said MacHeath.

Outside, in the corridor, they met Dr. Konrad Bern hurrying toward the cafeteria. He stopped as he saw them.

"Oh, hello, Mr. MacHeath, Mr. Griffin," he said. His white-toothed smile was friendly, but both of the S.M.M.R. agents could detect the hostility that was hard and brittle beneath the surface. "I wanted to thank you for the wonderful job you've been doing."

"Why, thank you, doctor," said MacHeath honestly. "We aim to satisfy."

Bern chuckled. "You're doing well so far. Odd streak of luck we've had, isn't it? Poor Dr. Nordred has been under a terrible strain; his whole life work is tied up in this project." He made a vague gesture with one hand. "Would you care for some coffee?"

"Just had some, thanks," said MacHeath, "but we'll take a rain check."

"Fine. Anytime." And he went on into the cafeteria.

"Wow!" said Griffin as he walked on down the corridor with MacHeath. "That man is scared silly! But what an actor! You'd never know he was eating his guts out."

"Sure he's scared," MacHeath said. "With all this sabotage talk going around, he's afraid there'll be an exhaustive investigation, and he can't take that right now."

Griffin frowned. "I guess I missed that. What did you pick up?"

"He's supposed to meet a Soviet agent tonight, and he's afraid he'll be caught. He doesn't know what happened to the first three, and he won't know what will happen to Number Four tonight.

"We'll keep him around as long as he's useful. He's not a Bohr or a Pauli or a Fermi, but he—"

MacHeath stopped himself suddenly and came to a dead halt.

"My God," he said softly, "that's *it.*"

His hunch had hatched.

After a moment, he said: "Harry is getting back from the target end of the tube now, Bill. He can't pick me up, so beetle it down to the tool room, get him, and get up to the

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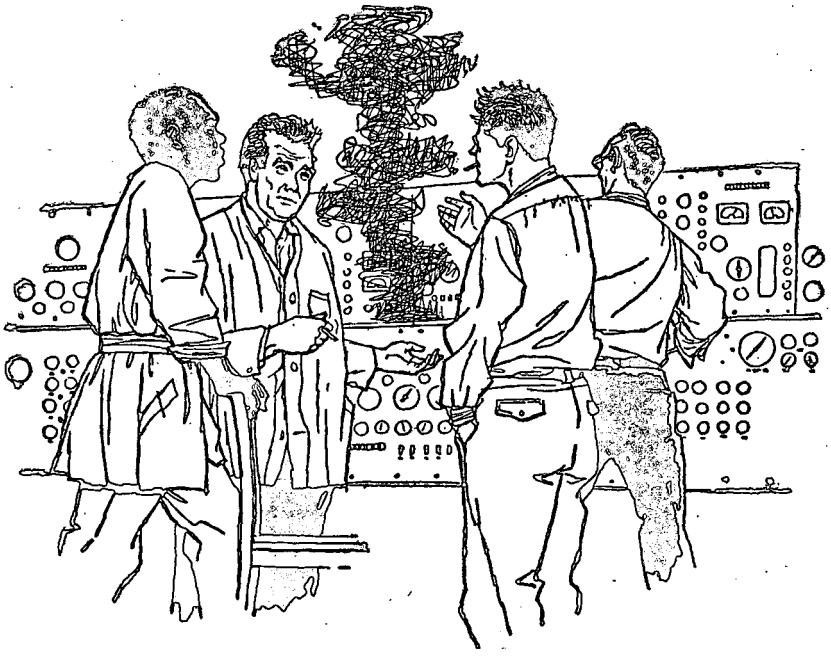

workshop fast. If I'm not there, wait; I have a little prying to do."

"Can do," said Griffin. He went toward the elevator at an easy lope.

David MacHeath went in the opposite direction.

When MacHeath returned to the workshop which he had been assigned, Bill Griffin and Harry Benbow were waiting for him. Beside the big-muscled Griffin, Harry Benbow looked even thinner than he was. He was a good six-two, which made him a head taller than Griffin, but, unlike many tall, lean men, Benbow had no tendency to slouch; he stood tall and straight, reminding MacHeath of a poplar tree towering proudly over the countryside. Benbow was one of those rare American Negroes whose skin was actually as close to being "black" as human pigmentation will allow. His eyes were like disks of obsidian set in spheres of white porcelain, which gave an odd contrast-similarity effect when compared with Griffin's china-blue eyes.

If the average man had wanted to pick two human beings who were "opposities," he could hardly have made a better choice than Benbow and the short, thickly-built, blond-haired, pink-skinned Bill Griffin. But the average man would be so struck

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by the differences that he would never notice that the similarities were vastly more important.

"You look as if you'd just been kissed by Miss America," Harry said as MacHeath came through the door.

"Better than that," MacHeath said. "We've got work to do."

"What's the pitch?" Griffin wanted to know.

"Well, in the first place, I'm afraid Dr. Konrad Bern is no longer of any use to the Redford Project. We're going to have to arrest him as an unregistered agent of the Soviet Government."

"It's just as well," said Harry Benbow gently. "His research hasn't done us any good and it hasn't done the Soviets any good. The poor guy's been on edge ever since he got here. All the pale hide around this place stirs up every nerve in him."

"What got you onto this?" Griffin asked MacHeath.

"A hunch first," MacHeath said. "Then I got data to back it up. But, first . . . Harry, how'd you know about Bern's reactions? He keeps those prejudices of his down pretty deep; I didn't think you could go that far."

"I didn't have to. He spent half an hour talking to me this morning. He was so happy to see a fellow human being—according to his definition of human being—that he was as easy to read as if *you* were doing the reading."

MacHeath nodded. "I hate to throw him to the wolves, but he's got to go."

"What was the snooping you said you had to do?" Griffin asked.

"Dates. Times. Briefly, I found that the run of accidents has been building up to a peak. At first, it was just small meters that went wrong. Then bigger, more complex stuff. And, finally, the Monster went. See the pattern?"

The other men nodded.

"You're the therapist," Griffin said. "What do you suggest?"

"Shock treatment," said David MacHeath.

Just how Dr. Konrad Bern got wind of the fact that a squad of FBI men had come to the project to arrest him that evening is something that MacHeath didn't know until later. He was busy at the time, ignoring anything but what he was interested in. It always fascinated him to watch the mind of a psychokinetic expert at work. He couldn't do the trick himself, and he was always amazed at the ability of anyone who could.

It was like watching a pianist play a particularly difficult concerto. A person can watch a pianist, see every move he is making, and why he is making it. But being able to see what is going on doesn't mean that one can duplicate the action. MacHeath was in the same position. Telepathically, he could observe the play of emotions that ran through a psychokinetic's mind—the combinations of avid desire and utter loathing which, playing one against another, could move a brick, a book, or a Buick if the

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mind was powerful enough. But he couldn't do it himself, no matter how carefully he tried to follow the raging emotions that acted as two opposing jaws of a pair of tongs to lift and move the object.

And so engrossed was he with the process that he did not notice that Konrad Bern had eluded the FBI. He was unaware of what had happened until one of the Federal agents rapped loudly on the workshop door.

Almostly instantly, MacHeath picked up the informaton from the agent's mind. He glanced at Griffin and Benbow. "You two can handle it. Be careful you don't overdo it."

Then he went to the door and opened it a trifle. "Yes?"

The man outside showed a gold badge. "Morgan, FBI. You David MacHeath?"

"Yes." MacHeath stepped outside and showed the FBI man his identification.

"We were told to co-operate with you in this Konrad Bern case. He's managed to slip away from us somehow, but we know he's still in the area. He can't get past the gate."

MacHeath let his mind expand until it meshed with that of Dr. Konrad Bern.

"There is a way out," MacHeath snapped. "The acceleration tube."

"What?'

"Come on!' He started sprinting toward the elevators. He explained to the FBI agent as they went.

"The acceleration tube of the ultracosmotron runs due north of here for two miles underground. The guard at the other end won't be expecting anyone to be coming from the inside of the target building. If Bern plays his cards right, he can get away."

"Can't we phone the target building?" the FBI man asked.

"No. We shut off all the electrical equipment and took down some of the wires so we could balance the acceleration fields."

"Well, if he's on foot, we could send a car out there. We'd get there before he does. Uh . . . wouldn't we?"

"Maybe. But he'll kill himself if he sees he's trapped." That wasn't quite true. Bern was ready to fight to the death, and he had a heavy pistol to back him up. MacHeath didn't want to see anyone killed, and he didn't want stray bullets flying around the inside of that tube or in the target room.

MacHeath and the FBI agent piled out of the elevator at the bottom of the shaft. Dr. Roger Kent was standing at the head of the stairs that spiraled down to the gun chamber. Dr. Kent knew that Bern had gone down the stairway, but he didn't know why.

"He's our saboteur," MacHeath said quickly. "I'm going after him. As soon as I close the door and seal it, you turn on the pumps. Lower the air pressure in the tube to a pound per square inch below atmospheric. That'll put a force of about a ton and a quarter against the doors, and he won't be able to open them."

Dr. Kent still didn't grasp the fact that Bern was a spy.

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"Explain to him, Morgan," MacHeath told the Federal agent. He went on down the spiral staircase, knowing that Kent would understand and act in plenty of time.

The door to the tube was standing open. MacHeath slipped on a pair of the sponge-soled shoes, noticing angrily that Bern hadn't bothered to do so. He went into the tube and closed the door behind him. Then he started down the blackness of the tube at a fast trot. Ahead of him, in the utter darkness, he could hear the click of heels as the leather-shod Bern moved toward the target end of the long tube.

Neither of them had lights. They were unnecessary, for one thing, since there was only one direction to go and there were no obstacles in the path. Bern would probably have carried a flashlight if he'd been able to get his hands on one quickly, but he hadn't, so he went in darkness. MacHeath didn't want a light; in the darkness, he had the advantage of knowing where his opponent was.

Every so often, Bern would stop, listening for sounds of pursuit, since his own footsteps, echoing down the glass-lined cylinder, drowned out any noise from behind. But MacHeath, running silently on the toes of his thick-soled shoes, kept in motion, gaining on the fleeing spy.

A two-mile run is a good stretch of exercise for anyone, but MacHeath didn't dare slow down. As it was, Konrad Bern was already tugging frantically at the door that led to the target room by the time MacHeath reached him. But the faint sighing of the pumps had already told MacHeath that the air pressure had been dropped. Bern couldn't possibly get the door open.

MacHeath's lungs wanted to be filled with air; his chest wanted to heave; he wanted to pant, taking in great gulps of life-giving oxygen. But he didn't dare. He didn't want Bern to know he was there, so he strained to keep his breath silent.

He stepped up behind the physicist in the pitch blackness, and judging carefully, brought his fist down on the nape of the man's neck in a hard rabbit punch.

Konrad Bern dropped unconscious to the floor of the tube.

Then MacHeath let his chest pump air into his lungs in long, harsh gasps. Shakily, he lowered himself to the floor beside Bern and squatted on his haunches, waiting for the hiss of the bleeder valve that would tell him that the air pressure had been raised to allow someone to enter the air lock.

It was Morgan, the FBI man, who finally cracked the door. Griffin and Dr. Kent were with him.

"You all right?" asked Morgan.

"I'm fine," MacHeath said, "but Bern is going to have a sore neck for a while. I didn't hit him hard enough to break it, but he'll get plenty of sleep before he wakes up."

More FBI men came in, and they dragged out the unprotesting Bern.

Dr. Kent said: "Well, I'm glad that's over. I'll have to get back and

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see what Dr. Nordred is raving about."

"Raving?" asked MacHeath innocently.

"Yes. While I was in the pump room, reducing the pressure, he called me on the interphone. Said he'd been looking all over for me. He and Luvochek and Bessermann are up in the lab." He frowned. "They claim that one of the radiolead samples was floating in the air in the lab. It's settled down now, I gather, but it only weighs a fraction of what it should, though it's gaining all the time. And that's ridiculous. It's not at all what Dr. Nordred's theory predicted." Then he clamped his lips together, thinking perhaps he had talked too much.

"Interesting," said MacHeath blandly. "Very interesting."

Senator Gonzales sat in Brian Taggert's sixth-floor office in the S.M.M.R. building and looked puzzled. "All right, I grant you that Bern couldn't have been the saboteur. Then why arrest him?"

Dave MacHeath took a drag from his cigarette before he answered. "We had to have a patsy—someone to put the blame on. No one really believed that it was just bad luck, but they'll all accept the idea that Bern was a saboteur."

"We would have had to arrest him eventually, anyway," said Brian Taggert.

"Give me a quick run-down," Gonzales said. "I've got to explain this to the President."

"Did you ever hear of the Pauli Effect?" MacHeath asked.

"Something about the number of electrons that—"

"No," MacHeath said quickly. "That's the Pauli *principle*, better known as the Exclusion Principle. The Pauli *Effect* is a different thing entirely, a psionic effect.

"It used to be said that a theoretical physicist was judged by his inability to handle research apparatus; the clumsier he was in research, the better he was with theory. But Wolfgang Pauli was a lot more than clumsy. Apparatus would break, topple over, go to pieces, or burn up if Pauli just walked into the room.

"Up to the time he died, in 1958, his colleagues kidded him about it, without really believing there was anything behind it. But it is recorded that the explosion of some vacuum equipment in a laboratory at the University of Göttingen was the direct result of the Pauli Effect. It was definitely established that the explosion occurred at the precise moment that a train on which Pauli was traveling stopped for a short time at the Göttingen railway station."

The senator said: "The poltergeist phenomenon."

"Not exactly," MacHeath said, "although there is a similarity. The poltergeist phenomenon is usually spectacular and is nearly always associated with teen-age neurotics. Then there's the pyrotic; fires always start in his vicinity."

"But there's always a reason for psionic phenomena to react violently

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under subconscious control," Senator Gonzales pointed out. "There's always a psychological quirk."

"Sure. And I almost fell into the same trap, myself."

"How so?"

"I was thinking that if Bern were the saboteur, all our theories about psionics would have to be thrown out—we'd have to start from a different set of precepts. *And I didn't even want to think about such an idea!*"

"Nobody likes their pet theories overthrown," Gonzales observed.

"Of course not. But here's the point: The only way that a scientific theory can be proved wrong is to uncover a phenomenon which doesn't fit in with the theory. A theoretical physicist is a mathematician; he makes logical deductions and logical predictions by juggling symbols around in accordance with some logical system. But the axioms, the assumptions upon which those systems are built, are nonlogical. You can't prove an axiom; it comes right out of the mind.

"So imagine that you're a theoretical physicist. A really original-type thinker. You come up with a mathematical system that explains all known phenomena at that time, and predicts others that are, as yet, unknown. You check your math over and over again; there's no error in your logic, since it all follows, step by step."

"O.K.; go on," Gonzales said interestedly.

"Very well, then; you've built yourself a logical universe, based on *your* axioms, and the structure seems to have a one-to-one correspondence with the actual universe. Not only that, but if the theory is accepted, you've built your reputation on it—your life.

"Now, what happens if your axioms—not the logic *about* the axioms, but the axioms themselves—are proven to be wrong?"

Brian Taggert took his pipe out of his mouth. "Why, you give up the erroneous set of axioms and build a new set that will explain the new phenomenon. Isn't that what a scientist is supposed to do?" His manner was that of wide-eyed innocence laid on with a large trowel.

"Oh, *sure* it is," said the senator. "A man builds his whole life, his whole universe, on a set of principles, and he scraps them at the drop of a hat. *Sure* he does."

"He claims he will," MacHeath said. "Any scientist worth the paper his diploma is printed on is firmly convinced that he will change his axioms as soon as they're proven false. Of course, ninety-nine per cent of 'em *can't* and *won't* and *don't*. They refuse to look at anything that suggests changing axioms.

"Some scientists eagerly accept the axioms that they were taught in school and hang on to them all their lives, fighting change tooth and nail. Oh, they'll accept new ideas, all right—provided that they fit in with the structures based on the old axioms.

"Then there are the young icono-

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clasts who don't like the axioms as they stand, so they make up some new ones of their own—men like Newton, Einstein, Planck, and so on. Then, once the new axioms have been forced down the throats of their colleagues, the innovators become the Old Order; the iconoclasts become the ones who put the fences around the new images to safeguard them. And they're even more firmly wedded to their axioms than anyone else. This is *their* universe!

"Of course, these men proclaim to all the world that they are perfectly willing to change their axioms. And the better a scientist he is, the more he believes, in his heart-of-hearts, that he really would change. He really thinks, consciously, that he wants others to test his theories.

"But notice: A theory is only good if it explains all known phenomena in its field. If it does, then the only thing that can topple it is a *new* fact. The only thing that can threaten the complex structure formulated by a really creative, painstaking, mathematical physicist is *experiment!*"

Senator Gonzales' attentive silence was eloquent.

"Experiment!" MacHeath repeated. "That can wreck a theory quicker and more completely than all the learned arguments of a dozen men. And every theoretician is aware of that fact. Consciously, he gladly accepts the inevitable; but his subconscious mind will fight to keep those axioms.

"Even if it has to smash every experimental device around!

"After all, if nobody can experiment on your theory, it can't be proved wrong, can it?

"In Nordred's case, as in Pauli's, this subconscious defense actually made itself felt in the form of broken equipment. Dr. Theodore Nordred was totally unconscious of the fact that he detested and feared the idea of anyone experimenting to prove or disprove his theory. He had no idea that he, himself, was re-channeling the energy in those machines to make them burn out."

Brian Taggert looked at MacHeath pointedly. "Do you think the shock treatment you gave him will cause any repercussions?"

"No. Griffin and Benbow held that block of radiolead floating in the air only while Dr. Nordred was alone in the lab. He pushed at it, felt of it, and moved it around for more than ten minutes before he'd admit the reality of what he saw. Then he called Luvochek and Bessermann in to look at it.

"Griffin and Benbow let the sample settle to the desk, so that by the time the other two scientists got to the lab, the lead didn't have an apparent negative weight, but was still much lighter than it should be.

"All the while that Bessermann and Luvochek were trying to weigh the lead block, to get an accurate measurement, Griffin and Benbow, three rooms away, kept increasing the weight slowly towards normal. And so far no one has invented a device which will give an instantaneous check on the weight of an object.

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A balance can't check the weight of a sample unless that weight is constant; there's too much time lag involved.

"So, what evidence do they have? Scientifically speaking, none. They have no measurements, and the experiment can't be repeated. And only Nordred actually saw the sample *floating*. Luvochek and Bessermann will eventually think up a 'natural' explanation for the apparent steady gain in weight. Only Nordred will remain convinced that what he saw actually happened.

"I don't see how there could be any serious repercussions in the field of physics." But he looked at Taggert for confirmation.

Taggert gave it to him with an approving look.

"It's a funny thing," said Gonzales musingly. "Some time back, we were in a situation where we had to go to the extreme of physical violence to keep from demonstrating to a scientist that psionic powers could be controlled, just to keep from ruining the physicist's work.

"Now, we turn right around and demonstrate the 'impossible' to another physicist in order to pull his hard-earned axioms out from under him." He smiled wryly. "There ain't no justice in the world."

"No," agreed MacHeath, "but the trick worked. He won't have any subconscious desire to smash equipment just to protect a theory that has already been smashed. On the contrary, he'll let them go through in order to find new data to build another theory on."

"He'll never again be the man he was," said Taggert regretfully. "He's lost the force of his convictions. He won't be capable of taking a nonsense, dogmatic, black-and-white stand. But it was necessary." He made an odd gesture with one hand. "What else can you do with a man who's a psionic psychopath?"

THE END

THE ANALYTICAL LABORATORY

This time we have a tie for second place.

JULY 1960 ISSUE

PLACE	STORY	AUTHOR	POINTS
1.	The High Crusade (Pt. 1)	Poul Anderson	1.28
2.	The Brotherhood of Keepers	Dean McLaughlin	2.78
	The Troublemaker	Christopher Anvil	2.78
3.	Subspace Survivors	E. E. Smith, Ph.D.	3.00

THE EDITOR.

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THIOTIMOLINE AND THE SPACE AGE

By ISAAC ASIMOV

Illustrated by Schoenherr

It is some years since we heard first of the fabulous properties of resublimated thiotimoline; Dr. Asimov now brings the subject up to date, showing its potential for the Space Age. Surely thiotimoline is just what rocketeers driven nuts by the unreliability of their "beasts" need. . . .

(*Transcript of a speech delivered at the 12th annual meeting of the American Chronochemical Society.*)

Gentlemen:

I have been called the founder of chronochemistry and in response I cannot resist a certain sense of pride. To have originated a new science is a privilege given to very few.

I can still remember, quite clearly, that day in 1947 when I first dropped a pinch of thiotimoline into water and thought I noticed something odd. To be sure, it dissolved rapidly; but I was used to that. It always seemed to vanish the instant it touched the water.

But I had never handled a sample of thiotimoline quite as pure as the pinch I had obtained that July day and, as I watched the white powder drop toward the water, I distinctly remember myself thinking "Why, that dissolved *before* it hit the water."

Well, it's an old story to you, I know, though I still like to linger on the thrill of the slow awakening of certainty; of the measurements

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taken; of the first crude timings by eye; of the more delicate work of the original endochronometer—the same instrument now at the Smithsonian.

The announcement of endochronicity, of the fact that a substance existed which dissolved in water 1.12 seconds *before* the water was added created a stir. You all remember it, I'm sure. And yet, somehow, the impression arose that thiotimoline was a hoax. There was a distinct air of amusement in many of the comments in the learned journals. Private communications reaching me showed a distressing tendency to describe experiments which obviously lacked all scientific validity and which, I could but conclude, were meant as some sort of joke. Perhaps the final proof of the damage this has done is that after twelve years of existence, the American Chronochemical Society can muster an audience of exactly fifteen people to hear this talk.

It has been an expensive joke, gentlemen, one that has cost us our lead in the race for space. For while American researchers have, but with difficulty, obtained grants to continue their investigations of thiotimoline and have been starved into small-scale experiments, while withering under the genial air of disbelief on the part of their colleagues, the Soviet Union has established the town Khrushchevsk in the Urals, whose popular nickname of "Tiotimolingrad" will well describe the nature of the activities that go on behind the walls of the modern and well-equipped scientific laboratories that have been established there.

That the Soviet Union has taken thiotimoline seriously and has done something about it is as sure as can be, and yet we remain sunk in complacency. No important political figure has viewed the matter with alarm. If they have said anything at all for publication, it is simply, "What's thiotimoline?"

I intend now to explain to these distressingly near-sighted politicos just what thiotimoline means to our space effort.

Thiotimoline research graduated from what we might now call the "classical" stage, to the "modern" with the development of the "telechronic battery" by Anne McLaren and Donald Michie of the University of Edinburgh. If you have read about it anywhere, you can only be clairvoyant, for the popular press and much of the learned press maintained a stubborn silence. In fact, the original paper appeared only in the small though highly respected, *Journal of Irreproducible Results,* edited by that able gentleman Alexander Kohn. Let me describe the telechronic battery to you.

A simple endochronometer—with which we are all acquainted—is a device which will automatically deliver water into a small tube containing thiotimoline. The thiotimoline will, of course, dissolve 1.12 seconds before the water is delivered.

Imagine the endochronometer so connected with a second similar unit that the solution of the thiotimoline

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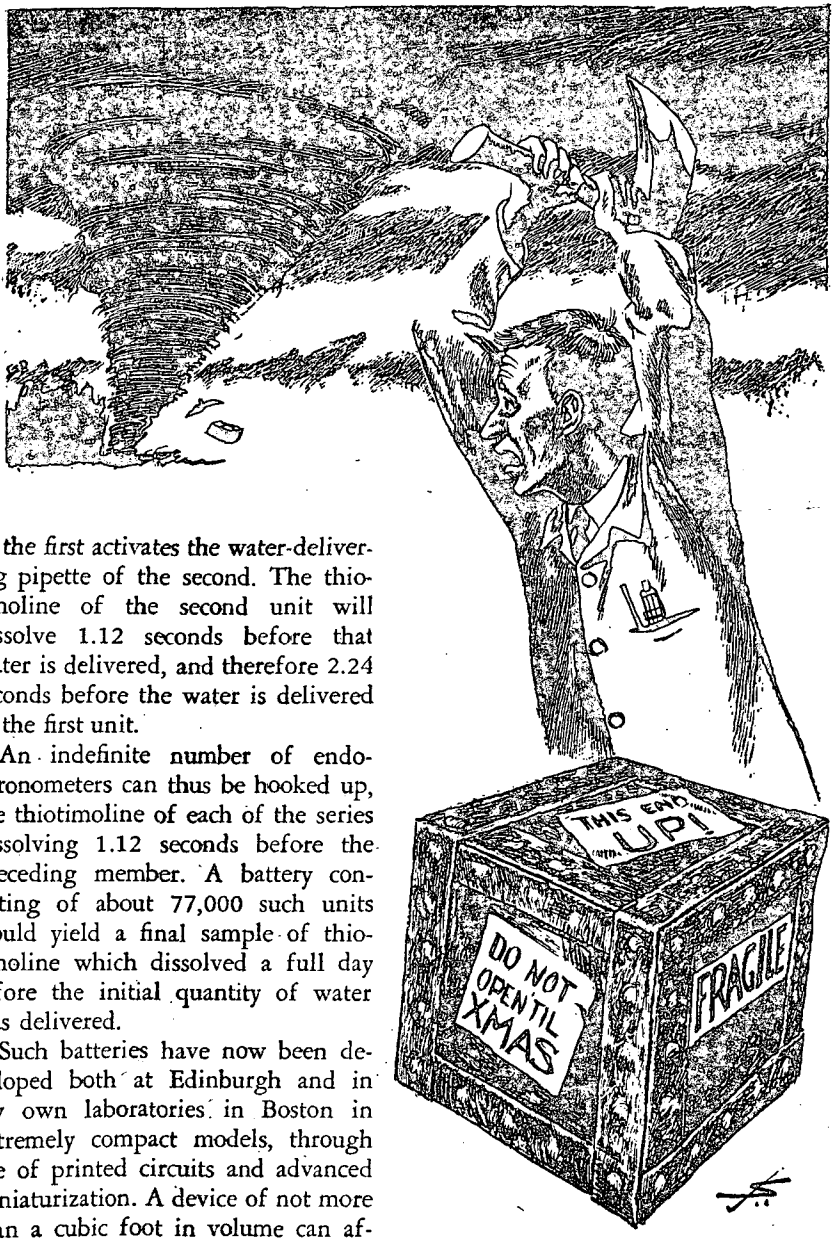

in the first activates the water-delivering pipette of the second. The thiotimoline of the second unit will dissolve 1.12 seconds before that water is delivered, and therefore 2.24 seconds before the water is delivered to the first unit.

An indefinite number of endochronometers can thus be hooked up, the thiotimoline of each of the series dissolving 1.12 seconds before the preceding member. A battery consisting of about 77,000 such units would yield a final sample of thiotimoline which dissolved a full day before the initial quantity of water was delivered.

Such batteries have now been developed both at Edinburgh and in my own laboratories in Boston in extremely compact models, through use of printed circuits and advanced miniaturization. A device of not more than a cubic foot in volume can af-

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ford a twenty-four hour endochronic interval. There is strong, if indirect, evidence that the Soviet Union possesses even more sophisticated devices and is turning them out in commercial quantities.

The obvious practical application of the telechronic battery is that of weather prediction. In other words, if the first element of a battery is exposed to the air in such a way that rain, if any, will fall upon it, the final element will dissolve the day before and thus offer a foolproof method of predicting rain—or lack of rain—one day in advance.

I trust you will all see, gentlemen, that the telechronic battery can be used for generalized predictions as well.

Suppose, to take a frivolous example, you were interested in a particular horse race. Suppose you intended to place a wager that a particular horse would win that race. Twenty-four hours in advance of the race, you could make up your mind quite firmly that if the horse were to win the next day, you would, immediately upon receiving the news, add water to the first element of a telechronic battery. If it did not win, you would not.

Having made that decision, you need then but observe the last element. If the thiotimoline in that last element dissolves—followed by a chain of solutions all along the battery at 1.12 second intervals, with which you need not be concerned—you will know that the horse will win beyond doubt. You might even, if you were in a flamboyant mood, allow the solution of the final element to activate a flashing light, a fire gong, a charge of explosive; anything that will unmistakably attract your attention.

You laugh, gentlemen, and yet can this system not be applied, without change, to the launching of a satellite?

Suppose that four hours after launching, an automatic device on board the satellite telemeters a signal to the launching base. Suppose, next, that this radio signal is designed to activate the first element of a telechronic battery.

Do you see the consequences? The sending of the signal four hours after launching can only mean that the satellite is safely in orbit. If it were not, it would have plunged to destruction before the four hours had elapsed. If then, the final element of the telechronic battery dissolves today, we can be certain that there will be a successful launching tomorrow and all may proceed.

If the final element does not dissolve, the launching will not be successful and there must, therefore, be something wrong with the satellite assembly. A team of technicians will begin checking the device and at the moment when the defective item is corrected, the telechronic battery will operate. The launching will then be scheduled in the full expectation of success.

Do you still laugh, gentlemen?

Is this not the only feasible explanation for the consistent Soviet

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successes in throwing their satellites into orbit as compared with our own very spotty record?

It is customary, of course, to attribute the appearance of unfailing success of Soviet launchings to the fact that they have been deliberately hiding many failures, but does this stand up? Have they not, with remarkable consistency, managed to score successes at such time as would most profit themeselves.

Sputnik I went up within a month of the hundredth birthday of Tsiolkovsky, the soviet rocket pioneer. Sputnik II went up to celebrate the fortieth anniversary of the Russian Revolution. Lunik II went up just before Khrushchev's visit to the United States. Lunik III went up on the second anniversary of Sputnik I.

Coincidence? Or did they simply have the foreknowledge of their telechronic batteries? Have they tested a number of possible rocket assemblies and selected that one for which success was forecast? How else can one explain that the United States has not yet succeeded in launching any of their many rockets on some significant day.

Nor, remember, do the Soviets invariably hold their announcements back until they are certain they have achieved success, as some have suggested. In at least one case, they announced an achievement in advance.

When Lunik III was on its way to circle the Moon, the Soviet scientists confidently announced it would take pictures of the hidden side of the Moon as it progressed round that body in its orbit. As far as the orbit of Lunik III was concerned, they were safe. From its motion and from the positions of Earth, Moon and Lunik, the orbit of Lunik III could be calculated with absolute precision.

How could the Soviet scientists, however, be so sure that the intricacies of the camera assemblage would work to perfection? Could it be that the successful completion of the camera-task was set to activate a telechronic battery at the launching base? Could its activation have allowed them to make their announcement a day before the pictures were taken with the full knowledge that success and a prestige-victory would result?

I say the answer is: Obviously, yes.

And what of future attempts to send a man into space? Suppose the man were to agree to send a signal, manually, after a certain time had elapsed after firing. A telechronic battery would then tell us, while the astronaut was still on the ground and unlaunched that not only would he be in orbit but that he would be alive and at least well enough to send the message.

If the telechronic battery remains inactive, the man will not be sent up. It is as simple as that. Since it is the chance of harm to an astronaut that is the deciding factor holding back the step of "man into space," it seems certain that the Soviet Union will achieve this goal first, thanks to our government's obtuseness with respect to thiotimoline.

Presumably, one can extend the principle to all manner of scientific

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and nonscientific investigations. Gigantic *mega-batteries* can even be built—in theory—to predict the result of an election to be held the following year—but I have labored the point long enough.

Let me, instead, make a few remarks concerning the great dangers as well as the great benefits, which are involved in thiotimoline research.

These begin with the oldest of all paradoxes of thiotimoline—the paradox of fooling. In other words, the chance of having thiotimoline dissolve and then being fooled by a refusal to add the water. The original argument against such a notion, as elucidated in my laboratory, involved the theory of the endochronic atom—which has since been confirmed by half a dozen other investigators. One pair of the bonds of one or more of the carbon atoms in the thiotimoline molecule are forced, through supersteric hindrance, to point in the temporal plane. One bond extends 1.12 seconds into the past and one extends 1.12 seconds into the future. When the future end of a thiotimoline molecule dissolves and drags the rest of the molecule with it, it is therefore not predicting a possible future event. It is recording an actual future event.

Nevertheless, it has been shown that fooling thiotimoline is possible in theory. Using Heisenberg's principle of uncertainty, it can be demonstrated that one cannot say with certainty that an individual molecule of thiotimoline will dissolve before the water is added and that, in fact, *the probability of its not doing so is* quite appreciable.

That is undoubtedly true—for an individual molecule. When, however, quintillions of molecules are involved as is the case with even the most microscopic samples of thiotimoline actually used in the individual units of even the most sophisticated telechronic batteries, the chance that all of those quintillions, or even a detectable fraction of them, will fail to dissolve is infinitesimal.

To be sure, in setting up a telechronic battery, in which many thousands of units are involved, the failure of the instrument will depend on the failure to dissolve of any one of those units. The chance of "Heisenberg failure," as it is called, can be calculated and some estimates at least seem to show that a battery will give a false positive one time out of rather more than a million.

In such a case, the final unit in a telechronic battery will dissolve even though water is not added to the first. Somewhat more often, the converse will be true; that the final unit will not dissolve in advance even though water is added to the first. Naturally the former alternative is more interesting from the theoretical viewpoint, the question arising: Then where did the water come from?

An attempt was made in my laboratories to actually record such a false negative involving solution without subsequent addition of water. The possibility of creation of matter out of nothing existed and this

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would be of great importance in connection with the Gold-Hoyle theory of the steady-state universe.

The principle involved in the attempt was simple. One of my students would set up a battery adjusted for the manual addition of water the next day, intending in all honesty to allow the experiment to take its course. The final unit would, theoretically, dissolve. I would then place the first student at a different task and put a second student in charge of the battery with instructions not to add water.

Our first great surprise was to find that the final unit actually dissolved, under these circumstances, about once in twenty efforts. This was a far greater incidence than could possibly be explained by "Heisenberg failure." But, as it rapidly turned out, the thiotimoline was not "fooled." Something, in every case, brought about the addition of water. In the first case, the original student returned to add the water and did so before he could be stopped. In another case, there was accidental spillage. In another, a janitor—

But it would be tedious to describe the manner in which thiotimoline, so to speak, refused to be fooled. Suffice it to say that not once did we discover a true case of "Heisenberg failure."

With time, of course, we began to guard against ordinary accidents and the incidence of "pseudofailure" declined. For instance, we placed the battery in closed, desiccated vessels; but, during pseudofailure, these cracked and broke.

In our final experiment we thought that surely we had a "Heisenberg failure" but in the end, the experiment was not reported in the literature. I tried instead, and without success, to report the implications of it to appropriate officials. Let me describe the experiment to you now.

We placed the battery in a welded steel container after it had registered solution.

And as we waited for the moment when the water should be added but would not, Hurricane Diane struck New England. That was in August of 1955. The hurricane had been predicted, its course had been followed and we were ready for it. There had been several hurricanes in New England in '54 and '55 and we were hardened to it.

At one point, though, the Weather Bureau announced the danger to be passed, the hurricane was blowing out to sea. We all heaved a sigh of relief as we waited for zero minute.

However, if any of you were in New England that day you will remember that the Weather Bureau announced later that it had "lost" the hurricane; that the backlash struck surprisingly; that five inches of rain or more fell in many places within an hour; that rivers rose and extensive flooding began.

I watched that rain; it was a deluge. I watched the small river running across our campus become a

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torrent and begin to spread up and out across the lawns while the lines of shrubbery seemed to grow out of roiled sheets of water.

I shouted for an axe. One of my students brought one, remarking afterward that I sounded so wild he was almost afraid I had turned homicidal maniac.

I smashed that steel container. I removed the telechronic battery and in the flickering gray light of that storm-lashed day, I filled a beaker of water and waited for zero minute, ready to douse the battery at the proper moment.

And as I did so, the rain slackened, the hurricane moved off.

I do not say we caused the hurricane to return and yet—water had to be added to that battery somehow. If the stainless steel container had to be floated away on a rising flood and smashed by wind and water to have that done, it would be done. The original solution of the final unit predicted that; or else it predicted my deliberate subversion of the experiment. I chose the latter.

As a result of all this, I can envisage what I can only call a "peace bomb." Enemy agents working within a particular nation, can assemble telechronic batteries, operate them until a case occurs in which the final unit dissolves. That battery can then be encased in a steel capsule and placed near a stream well above high-water mark. Twenty-four hours later, a disastrous flood is bound to occur, since only so can water reach the container. This will be accompanied by high winds since only so can the container be smashed.

Damage will undoubtedly be as great in its way as would result from an H-Bomb blast and yet the telechronic battery would be a "peace bomb" for its use will not bring on retaliation and war. There would be no reason to suspect anything but an act of God.

Such a bomb requires little in the way of technology or expense. The smallest nation, the smallest of revolutionary or dissident groups could manage it.

Sometimes in my more morbid moment, I wonder if perhaps Noah's flood—the prototype of which has actually has been recorded in Mesopotamian sediments—was not brought about by thiotimoline experiments among the ancient Sumerians.

I tell you, gentlemen, if we have one urgent task ahead of us now it is to convince our government to press for international control of all sources of thiotimoline. It is boundlessly useful when used properly; boundlessly harmful when used improperly.

Not a milligram of it must be allowed to reach irresponsible hands.

Gentlemen, I call you to a crusade for the safety of the world!

THE END

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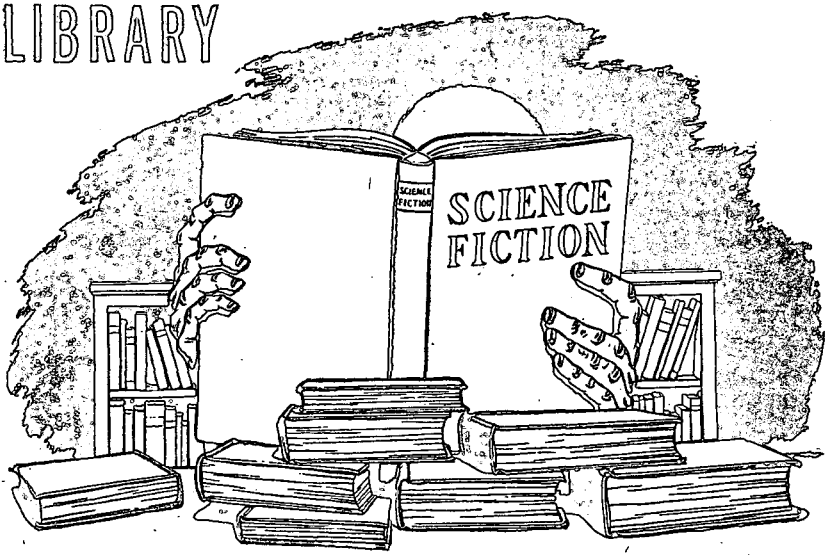

By P. SCHUYLER MILLER

TIME TRAVELER'S STORIES

RANKING in sheer idiocy somewhere just behind the book ads that begin "Now in every book store!"—when the publisher knows very well that only potential bookclub stuff is routinely stocked—are the bland academic commentaries on science fiction that assume that the books of pioneers like Jules Verne and H. G. Wells are "in every library." I've been hunting both writers for thirty-five years, and I still haven't read or even seen everything they wrote. Nor will I, if I look in libraries.

The consequence of this is that a new generation of readers knows very little about Wells and less about Verne—or it may be the other way around, now that Hollywood has adopted the French master with its usual hearty disregard for what he was trying to do. So it's nice to

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to find that some anonymous time traveler has retrieved one more Verne book, three of Wells' tales, and an almost legendary novel by a third Nineteenth Century master and set them down on our tables in current reprint editions.

The books in question, to get the vital data out of the way, are Ace Books' reprint of Verne's "The Purchase of the North Pole"—No. D-434; 159 pages; 35¢—Dover Publications' "Three Prophetic Novels of H. G. Wells," containing the complete, first-appearance texts of "When the Sleeper Wakes," "A Story of the Days to Come," and "The Time Machine"—No. T-605; 335 pp.; $1.45—and "Caesar's Column," by Ignatius Donnelly, better known for his "Atlantis." This last has been published by Harvard University as an important curio; it runs to three hundred thirteen pages plus a twenty-seven-page introduction by Professor Walter B. Rideout of Northwestern University, and costs $4.50.

The five stories are contemporaries: Verne's book was out first, in 1889, as a sequal to "From the Earth to the Moon" of some twenty years before. "Caesar's Column" followed in 1890; it is of the utopian company of Samuel Butler's "Erewhon"—1872—and more immediately, Edward Bellamy's astoundingly successful "Looking Backward" of 1888. Wells' "Time Machine" came along in 1895, and is the most timeless of them all, while the other two Wells offerings were out in 1899.

I hadn't seen "The Purchase of the North Pole" since Hugo Gernsback ran it as a two-part serial in *Amazing Stories* in the fall of 1926. This is a second adventure of the members of the Baltimore Gun Club, but in its high good humor it is almost a parody of "Earth to the Moon." The elderly Verne missed no chance to poke fun at the diplomats of all Europe, dispatched by their several governments to buy the Arctic region at auction but unwilling to put more than a few shillings into a common fund to block the Americans. He has fun, too, with stereotype American tycoons and with the foibles of those old friends of the Gun Club, President Impey Barbicane and J. T. Maston of the iron hand, now harassed by a female millionaire who has bought him the Pole.

Verne being Verne, there is a daring scientific gimmick embedded in the satire. The Gun Club, having bought the Pole—they supposed it to be a plateau like Antarctica, as did Verne—intends to tip the Earth's axis with a blast of a monstrous cannon, vaster yet than the Olympiad that sent them to the Moon. This will melt the polar ice, reveal great deposits of coal, and make them all rich. In fact, this profit motive and the ruthlessness with which Barbicane proceeds to carry the project out at a hidden base, in full expectation that much of the world will be drowned under the shifting seas and more of it suffocated at ultra-Himalayan altitudes, is the great flaw of the book. There is one more flaw—Verne's usual gimmick—which explains why

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we are not now high in the air or at the bottom of the sea.

Read for its fun-poking, the book is still entertaining. Today's theories are not those of Verne's day, and some time with a pad of paper would probably blast a hole in his math, especially the part that would shoot sea-level cities five miles into the air. The plot gimmick that saves everybody is still being used, and is no more convincing now than it was in 1889—but Verne was one of the first in line.

With "Caesar's Column" we have something quite different: an axe-grinding novel set in the "far" future of 1988, through which the author evidently hoped to arouse support for his own utopian ideas, as Bellamy had just done with the much better known—and much duller—"Looking Backward." Professor Rideout's excellent essay on Donnelly and his work makes clear that he was an inevitable espouser of lost causes, but he does take the trouble to spin a lively plot to support his social preaching, he hits hard on a universal of all such books and of human relations, and he has scenes that roll well off the tongue when read aloud: they might go well in a Charles Laughton reading.

Gabriel Weltstein, Donnelly's hero, is a young Swiss sheepraiser settled in Uganda, who has come to New York to try to by-pass the middlemen of the Wool Trust. He finds himself in a society of stratified corruption, with a viciously brutal oligarchy of international wealth at the top, a crushed-down working class at the bottom, and nobody much in between. Gabriel's humanitarian upbringing sends him to the aid of a seeming beggar, who turns out to be a disguised leader of a pending revolution. Now in bad with the local authorities, Gabriel is drawn into the plot. He spies on the central council of the Oligarchy, rescues a lovely damsel from the harem of one of the tycoons, talks out of turn when he should have been mouse-quiet—as heroes and heroines still do today in book after book—and finally has to flee for his life when the revolution bursts into a blood purge. In the end, Gabriel, his Estella, and their relatives and friends are living happily in his kind of Utopia in a hidden valley in the mountains of Uganda.

Of course the book is dated by its Victorian ancestry. The world of 1988 has airships—dirigibles—and aerial bombing, but it uses horses for locomotion at ground level. Most striking of all is that Donnelly, in spite of his experience and efforts as a social reformer, did not foresee any changes in the values of his own day during the century to come. The kept women of the book are virtuous but hungry. The decor of the late Twentieth Century is that of a well-to-do late Nineteenth Century parlor. Dynamite is still the epitome of destructive power; it was the A-bomb of its day. And, as in practically all books of its kind, the action is stopped short from time to time

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to explain what the hero sees, or argue his ideas.

For all this, Donnelly reveals himself as a shrewd and realistic student of humanity, who knew that he would trap more listeners by telling a rousing story than by preaching. For the revolt that is to free humanity and bring Utopia ends by simply upending American society and creating a new oligarchy of blood-drunk power-seekers. Caesar, leader of the revolt, builds his column of corpses in Union Square, and as the book ends his own gigantic head is carried through the smoke-drenched streets of New York on the end of a pike. Even in Gabriel's own little Utopia, serenely away from the world of blood and power, provision must be made for the poor who are part of the Victorian society—he is not so unrealistic as to suppose they will disappear, no matter how ideal the world.

And what seems to me to be the author's real message is almost an aside during one of the lengthier discussions: that there *is* a time in the history of every society when the final stratification of power and the following destruction can be averted by the formation of a "Brotherhood of Justice"—formed by men of good will at a time when good will still has some meaning and force. That time, Gabriel's informant tells him, was "a hundred years ago"—at the time when Donnelly wrote his book. *Now* is the time to save ourselves from Caesar's column.

Nine years later, H. G. Wells projected an observer of his own and Donnelly's time into a society of two hundred years later, when another revolt of the oppressed was about to break, and when another set of opportunists were preparing to substitute their iron rule for the one they had broken. This new Dover reprint of "When the Sleeper Wakes" is *not* the "first book printing in more than fifty years," since Ace brought out a paperbook edition from what looks like the identical first-edition text, last year. However, in editing the Dover anthology, Everett Bleiler has pointed out that the three stories of the future are really companions, building a consistent picture of a future world as carefully integrated as Heinlein's "Future History" or Asimov's "Foundation." He has also rescued a lost fragment of "The Time Machine," which happens to be the first bit of that wonderful story that I ever saw—in a literary encyclopedia—and one for which I hunted for years, locating it at last in the original serial version. (Bleiler to the contrary, this *New Review* serial was already called "The Time Machine.")

I don't know that I need go into the plot of "When the Sleeper Wakes." Graham, in a deathlike trance, sleeps for two centuries and awakes in a London which has become a megalopolis like Donnelly's New York, only far more advanced technologically. It is a glassed-in city of moving walkways, bellowing news machines, television, and a host of other scientific marvels which Wells

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could and did imagine and Donnelly did not. Graham's modest fortune has pyramided until he owns half the world. His guardians and managers have raised a structure of despotism around themselves, which is about to be overthrown in the name of the blue-canvas-clad serfs of the Labour Company. Lending his legendary figure to support the revolt, Graham soon finds—as Gabriel did—that the new tyranny is no better than the old: the faces in the council of oppression are merely different. But where Gabriel fled to found an order more to his liking, Graham dies fighting the new tyrant.

We get other glimpses of this same world of the glassed cities and the moving ways in "A Story of the Days to Come," whose main interest is in its relation to the "Sleeper." This is a rather routine soap opera, in which a stubborn young heiress and a worthy young technician marry and try to beat the System. We get a more rounded picture of the world of 2100 than Graham ever got—and when the story is presented as it is here, we realize that Wells, too, was teaching Donnelly's lesson, for Elizabeth and her young man live and suffer in a cruelly regimented world *after* Graham has made his quixotic attempt to give London back to the people.

In spite of the technological virtuosity of Wells' world of the Twenty-second Century, there are odd holes in his imagining. His ships are still sailing ships, and farming is on a subsistence level primitive even for 1899. His aeroplanes, important to the plot, are meticulously described descendants of the overgrown box kites of Lilienthal and Langley, with passengers dangling in open chairs below a skeleton frame. He had the moving ways that Heinlein used to good effect in "Roads Must Roll," but failed to foresee concrete highways—though his Eadhamite is a kind of macadam or black-top. And the public halls of London are as Victorian as the littered parlors of Donnelly's New York a century before.

These stories emphasize Wells' essential modernity, and "The Time Machine" provides the capping proof. Read in this context, the Morlocks are the crushed, degenerate descendants of the blue-clad Labour Company slaves of millennia before. The Eloi have their source in the human butterflies Graham met in his first days of exploration. The process of degradation and devolution of which both he and Donnelly warned has come to its bitter end—rather, it does in the "lost" fragment, when men are hopping rabbits under a dying sun, the prey of giant centipedes. It is one of Wells' most powerful pictures, and Everett Bleiler and Dover have done us a service to restore it.

In all three visions of Armageddon, Wells is the skilled storyteller, carrying us into his world instead of showing it to us through a window. Here, again, he is the father of modern science fiction and—more than Donnelly because of his greater skill

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and experience—the heir of Verne. But where Verne's school of science fiction was the gimmick school, with the plot as hero, Wells and Donnelly pioneered in the kind of science fiction that is maturing in our own day, with *ideas* as heroes.

WORLD WITHOUT WOMEN, by Day Keene & Leonard Pruyn. Gold Medal Books, N. Y. No. S-975. 176 pp. 35¢

At first glance this original novel may seem to be just another attempt to sex up a science-fiction theme, and chances are that you'll find the book in the sexy section of your paperback display rack. Actually, it's too well done to fall into that pure black—or pure red—category.

Day Keene is reportedly an experienced Hollywood and TV writer who has done a long string of original blood-and-bust detective yarns for Gold Medal. He has just teamed with Dwight Vincent to write a "serious" novel about rural Iowa in 1921, "Chautauqua," which has had good reviews, and now has taken another partner for this switch on Pat Frank's classic "Mr. Adam."

The similarity stops there. "Mr. Adam" gave us a hero who was the last man in the world, and who in a hilarious, bawdy, frolicking tale did his best for womankind. In "World Without Women," a mysterious epidemic—perhaps spread in an attempt at bacterial warfare—has wiped out most of the women in the world, and made the few survivors sterile. And the male world is ravening on their trail.

Trying to patch up a ruined marriage in the Galapagos Islands, Reed and Connie Renner return to Los Angeles to find the city—and the world—in perpetual siege. Troops dig in on their lawn to protect Connie and preserve Renner's marital rights. A local gang lord is slowly building himself a harem, by bribe and by force. Male fertility cults have sprung up among the unbalanced. A women's prison, where there are stories of Lesbian orgies, is under siege.

In this chaos, Renner—who has one of the world's few women in name but not in reality—tries to help the leaders of his former community reach some kind of stability. The situation is developed sensationally, as might be expected. I no more believe that the whole city would be converted into ravening, raping, sex-maniacs than I do in the placid acceptance of destruction in "On the Beach." There is a tense inner plot in which Renner and his law partner try to destroy the gang lord, and he in turn tries to get back at Renner through Connie. It is all very competently handled, and a kind of answer to the cry that there's no sex in science fiction. But I still prefer "Mr. Adam."

UNEARTHLY NEIGHBORS, by Chad Oliver. Ballantine Books,

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New York. No. 365-K. 144 pp. 35¢

Chad Oliver's career as a science-fiction writer has paralleled his advance from a student of anthropology in Texas to a professional anthropologist in Colorado, and he has not wasted his training. Here is a novel with a pure anthropological—or if you prefer, xenological—theme: the attempt of Mankind to understand the culture of an extraterrestrial race.

The humanoids of the Sirius system are strange in many ways. They seem well advanced beyond mere savagery, yet they have no artifacts at all. They seem haunted by a baseless fear of the men who try to make contact with them—Dr. Monte Stewart and the handful of scientists working with him. And suddenly, without reason, they strike and slaughter the greater part of the little expedition, including Stewart's wife. Shall Man strike back and wipe them out? Shall we pass them by and seal them off? Or can Monte Stewart go back and succeed where he first failed?

The latter, of course, is what he does, or this would be just another bitter story about Man's inability to get along with anyone different. But this is a story of the type that Kingsley Amis has characterized as "the idea as hero." Stewart must find the idea that will enable him to understand the Merdosi, and help them to understand him. Since telepathy is called in for the final solution, I suppose the book really does not help solve that ultimate "first contact" problem in any useful way. But it does reveal a culture that can be complex where it seems primitive, understandable where it seems most incomprehensible. We have that kind in plenty here on Earth.

TWISTS IN TIME, by Murray Leinster. Avon Books, N. Y. No. T-389. 160 pp. 35¢

This collection of time-travel stories by a writer who is probably the science-fiction field's longest-functioning professional badly needs his most famous time story, "Sidewise in Time," to give it distinction. True, that classic has been anthologized rather often, but it would add color and originality to an otherwise pretty ordinary collection.

There are seven stories in the lot, ranging in age from the slapstick "Fourth-Dimensional Demonstrator," published here in *Astounding* in 1935, down to "Rogue Star," written for this book. The latter—and a couple of the others—suggest that in more than a generation of writing, this old pro is letting himself get a little careless. He dreams up a gimmick in which a wandering negative-matter star drags a spaceship into the past, so that its crew brings civilization to Earth of forty thousand years ago . . . but in actuality, agriculture, pottery, weaving, metal-working, and the other things that our temporal castaways are supposed to have brought did not appear until many, many thousand years later. Thus a small, relatively

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unimportant inaccuracy can spoil the point of a story.

The best yarn in the book, taken as an example of pure professional story-telling, is "Dead City" from *Thrilling Wonder* of 1946. Following a trail of artifacts that shouldn't exist, archeologists find a blasted city that shouldn't exist either, deep in the Yucatan jungle. Time-traveling creatures who built the city some twenty thousand years ago, and who are slave-raiding into their future, discover the expedition, and the tussle begins.

The most memorable as a story is a delicate little fantasy, perhaps oversentimental for some tastes, "The Other Now." In one now, Jimmy Patterson has lost his wife in an automobile accident; in another, he was the one killed. Through a door that opens twice and a diary that is in two places at once, they come together.

The comic aspects of time paradoxes are played up in three of the seven stories. "The Fourth-Dimentional Demonstrator" is slapstick comedy of its era, what with a dahlia-eating kangaroo, a strong-minded chorine, a couple of Treasury agents, and assorted coins and currency all being duplicated. "Dear Charles" is almost as giddy, with a Twentieth Century inventor snatching his umpteenth-great-grandson's girl from the Thirty-fourth. Best of the three, though, is "Sam, This Is You," in which the hero improves his fortune and gets his girl by talking to himself through time.

Finally, "The End" is another action story of a struggle in the far future, on a dying Earth, in which a group of men try to apply lost secrets of the past to escape the collapse of the Universe.

Murray Leinster's skill assures that these stories are well told, but they're not exceptional.

DR. FUTURITY, by Philip K. Dick. **SLAVERS OF SPACE**, by John Brunner. Ace Books, N. Y. No. D-421. 138 & 118 pp. 35¢

"Action from Ace" is the slogan here, with two expert practitioners, one American, one English.

"Dr. Futurity" provides us with a duly unpleasant future society, in which immortality is government-administered, teen-age gangs serve as a scavenging squad for malcontents, suicide is routine, and it is a crime to heal. Dr. Jim Parsons, snatched into this environment by a time-dredge—out of a time rather far in our own future—naturally has to fight his way out. He gets unexpected help, then finds that accepting it has involved him in an effort to change history and made him a murderer instead of a healer. Some details of the future culture are brilliantly drawn; others, like the hybrid Latin-German-whatsit language, just don't convince. By the end, it's a little hard to work out the score or even tell who's up.

Somebody has thrown away any surprise in the theme of John Brunner's galactic adventure by spelling

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it out in the title. The *Saturday Evening Post* has also been known to indulge in this brand of idiocy by having an illustrator draw a murder scene, with the killer perfectly recognizable. We have left the story of how young Derry Horn, heir to a robot-making empire, becomes involved in the murder of a Citizen of the Galaxy, and how he back-tracks to the out-worlds where human children are kidnaped and made into blue-skinned, sterile, conditioned "androids." It moves fast, and the mystery of the androids would have been worked out slowly if it hadn't been thrown in the reader's face.

Incidentally, now that Asimov's Laws of Robotics have settled into the general pattern, who started the stereotype of blue androids? The term, I think, can be credited to Edmond Hamilton, but who stained 'em blue?

LAROUSSE ENCYCLOPEDIA OF ASTRONOMY, by Lucien Rudaux and G. de Vaucouleurs. Prometheus Press, New York. 1959. 506 pp. $15.00

You may have seen this magnificent volume in time to get the prepublication price of $12.50, or you may know a bookstore—especially if you're in New York or Chicago—that will still give it to you. In fact, in those towns you may be able to take adavantage of a price war . . .

This is a recent English translation and revision of an older French book—Vaucouleurs is now in the United States—dating from just after the war. It has not been as thoroughly up-dated as it should have been: there is no section on radio-astronomy, for example, and the references to it are pretty skimpy, but they are there, including one of the later Dutch "photographs" of our own galaxy from "outside," reconstructed from their own and the Australian radio-telescope data and showing the spiral structure.

Even with this sort of reservation, this is a terrific book that belongs in every library and many private shelves, including mine. There are four divisions: a short introductory one on the heavens as seen from Earth; a whopping big one—nearly two hundred fifty pages—on the solar system, including compact, thorough accounts of the individual planets, with full-page paintings of Mars, Jupiter and Saturn and maps of the Moon and Mars; another big one on the stars and galaxies; and a final fifty pages, more or less, on instrumentation. The book and its eight hundred eighteen illustrations have been lithographed in Czechoslovakia, where some of Europe's—and the world's—best printing is done; this is why it costs $15 instead of $30.

THE END

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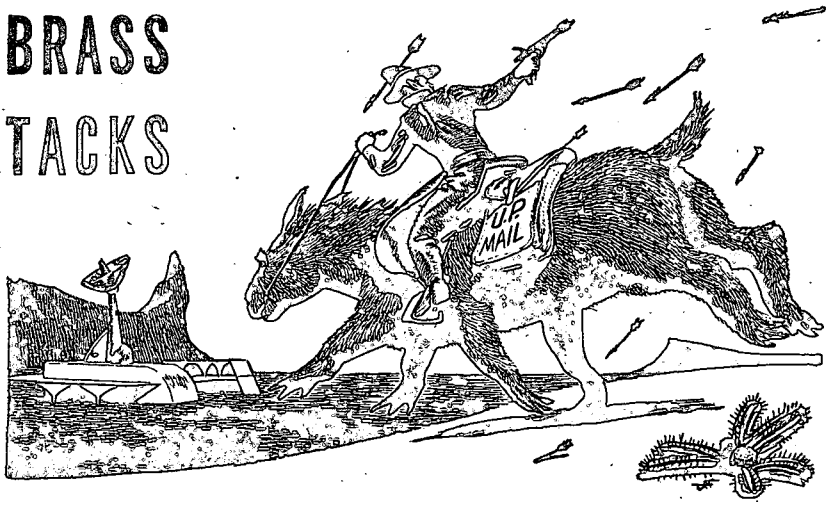
BRASS TACKS



Dear Mr. Campbell:

I can personally testify that you have built a fire under the United States Patent Office.

I sent off a quarter and a request for a copy of Dean's patent to the Patent Office on April 23rd, four days after the May *Astounding* hit the stands.

That was four days too many.

Four weeks later, I got back the request, *sans* quarter and accompanied by a form stating that they were all out of copies of 2,886,976, I would have to wait six more weeks, and it won't do any good to send them threatening letters.

The Patent Office must have been swamped by requests for 2,886,976 from every ASF reader interested in the Dean device to the extent of an investment of twenty-five cents. *Somebody, somewhere* in the city of Washington, is having the Dean device most painfully brought to his attention. If your proposals for legislatively enforced investigation of Dean's gadget and for "Two-Party Technology" get proportionate attention, you've got it made.

This whole Dean-machine flap, incidentally, illustrates why I am an ANALOG man in the ANALOG-Astounding controversy. Sure, the name "Astounding" means a lot to some of the SF-reading population; but if I tried to discuss the Dean device with some of my non-SF-reading friends, and mentioned "Astounding Science Fiction", I'd be answered by a Greek chorus of snickers and guffaws.

Why don't you try this with the Dean device, a rotational-unidirectional conversion in reverse:

Say you have a piece of heavy machinery that involves a rotation shaft, and you want to brake the shaft

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smoothly and quickly. Simply run a Dean unit, with no power to the solenoid, off the shaft. When the shaft is to be stopped, cut its power source and activate the solenoid; the Dean unit is so rigged as to try to lift the whole building. It's my guess that the opposing weight of the building will quickly damp the rotation of the shaft.

It may be some small consolation to the orthodox physicist to point out that the Dean system may not necessarily demolish the conservation concepts. It's conceivable that a mathematics adequate to describe the Dean system could also show mass-energy and momentum to be conserved in a fashion we can't imagine yet, lacking the math. Already there are some very subtle conservations in particle physics, most readily visualized by pure math, that are "really" mass-energy conservation, though you'd never guess it.

Your statement about the psychologists' lack of math ". . . for their work" was a mite vague, but if you meant "math for the solution of personality, conditioning, et cetera problems working from the physical structure and arrangements of the nerve cells," consider the effect that this would have on psionics.

If psionic ability is inherent in the human nervous system, and *if* the new mathematics accurately describes the possible interactions of the human nervous system, then psionics will be mathematically demonstrable —once we develop the math! It might not be usable information for quite a spell—don't forget, it was a quarter of a century between the prediction of the antiproton by Dirac's formula and the discovery of the particle in the laboratory—and it certainly wouldn't be accepted at first, but it should at least make psionics a legitimate subject of controversy.

More of Mark Phillips' "Sir Kenneth J. Malone, Q.O.F.B.I."! More by Walter Bupp! More covers by Schoenherr!—David Burwasser, 3683 Severn Road, Cleveland 18, Ohio.

By the time this is published, there may be considerable published news on the Dean device—but there has REALLY been reaction from industry!

Dear Mr. Campbell:

I have been a fanatical reader of Astounding for the last six years and I have a collection that is about ninety per cent complete reaching back to 1930. As a fanatic, I am the first to grant you fantastical license, but I think unreal "scientific" examples used as comparisons are not necessary. I am referring to Mr. Langart's "What the Left Hand was Doing," and his saying an ice cube in water at O degrees Centigrade would reform into a sphere.

It is true there would be molecular rearrangement in such a case, but it would be to form a cube, not a sphere. Since ice is a crystalline substance it would try to complete its crystal in such a case, however I believe it would be difficult to attain

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a perfect cube in an actual experiment because of the delicate elements of temperature and impurity and the further complicating element of time. It would be easy to show that a sphere is not formed, however.—Cadet 4/c H. D. Hoffman.

You and Langart are both correct; ice will not form a sphere—but Langart said that. It won't form a cube, either, because of slight irregularities of temperature, water currents, et cetera, which tend toward the random—distribution form—a sphere!

Dear John:

Am sulking hard—the reason being the letter from my fellow mariner, Miss Sandra J. Fulton, in the January, 1960, Brass Tacks.

Miss Fulton says regarding "The Outsiders"—"Not bad, but Chandler has done better . . ."

Too flaming right he has—and one of the things that he's done better is "Giant Killer" which, in the same letter, she attributes to P. Schuyler Miller.

The game's crook—A. Bertram Chandler.

Yoicks! I slipped too, in not catching that on the way past!

Dear Mr. Campbell:

As any professional scientist knows, if you drop a cat upside down it can not turn over in the air because it has nothing to act against. But as an amateur, I know it can because I tried it. An interested young cat can right itself in as little as one foot of drop.

First, it turns its belly in the opposite way it wants to turn. With the reaction to this momentum it turns its feet, held close to its body, in the other way. Then it extends its legs full length, perpendicular to its body, and, with the leverage thus obtained it turns its belly the same way its feet went a fraction of a second before and lands precisely on its feet.

This would be a very handy system to use to maneuver a spaceship without steering rockets or gyroscopes. I have pitched a cat out on a sub-zero night and had it turn around in the air, land running and get back in the house before I could close the door. So you do not have to take a long drive to see unidirectional momentum demonstrated; try the cat. But drop it on something soft, if it is an old pet it may not turn over, just fall on its back and give you that I-didn't-think-you-would-do-that-to-me look. After a few falls it will exert itself. An alley cat is not so good: it will push on your hands to turn itself over and spoil the experiment.

Since I am writing I will mention your stories. Some of them, especially in the March-April issues were corny. From the first few words I could predict every move they would

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make. Sometimes I think that if it were not for the scientific information I pick out of it and the Brass Tacks I would not renew, but then you will come out with some that remind me of Hugo Gernsback at his best. Some of the most interesting things I have found in it come from the Brass Tacks Department. I really appreciate the scientific news. Some of the most advanced discoveries have come to my knowledge in your magazine six months before they show up anywhere else.

I have been reading science fiction for forty years and am bound to have seen a lot of those plots before, so do not take my criticism too seriously.—Paul L. M. White, Moyie Springs, Idaho.

Well—the cat drive system isn't quite the same thing. And you must have used inferior alley cats, I recall the one I tried definitely did not push on my hand, it clung with eight claws and four teeth. I counted later.

Dear John:

Glancing through Brass Tacks I read Robert Jennings' plea for group psi experiments.

One I have experience with follows:

A group of twenty people form a circle. Three from the circle are picked. An object, preferably one easily recognized and small enough to be easily visualized is chosen. One of the three is blindfolded and placed in the center of the circle. The other two segregated from the circle grasp the blinded one by the wrist to keep him from falling on his face.

The blind one has viewed the object and is instructed to concentrate on finding said object. I have found the best method of concentration is silent repetition of the phrase "Where is the (object)."

While this is going on, the object has been passed around the circle and stopped at random. All those in the circle are instructed to fix their attention on the *location* of the object and to try to compel the blind one to go to that location.

I have tried this experiment several times with different groups.

The first time I tried it as the blind one produced the strongest reaction to date.

I *ran* blindfolded across a thirty to forty foot circle, leaving my guides standing on the opposite side. I came to a stop before the person holding the object—a pen—and when the startled girl dropped it, bent at the waist and caught it before it hit the ground.

I have made the following observations:

1. Strength of the reaction increases if there is a blood or marital relationship between the person holding the object and the seeker of the object.

2. Decreasing the size of the group decreases the probability of response.

3. Increasing the size increases the

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probability of response with a given individual.

4. In any group of twenty or more at least one and usually several persons can achieve the desired response.

5. Persons who state that they don't believe it possible to find the object have, without exception, been unable to do so.

Further observation: Response varies from the case described above to the comparatively feeble response of stopping in front of the person with the object and saying "I think it's here."

I have only observed the complete response twice. Once myself, and once from the circle.

In my own experience, the holder of the object was my sister. The other case involved a man and his wife.

Subjectively, the complete response was compulsive and not wholly on a conscious level. I went from a feeling I was falling, into a run. I remember being mildly surprised to find myself running. The same thing when I stopped and stooped to catch the object. The action was taken, and then I became aware of it. I did not consciously know where the object was, only that I was running, et cetera.

The experience left me completely exhausted, badly frightened and in a state of extreme agitation, trembling violently.

This is the only group experiment I am familiar with. I, too, would be interested in learning of others.

There are a number of possible controls that can be used to rule out sensory impressions such as olfactory and auditory cues. I have not as yet tried them.

I do not know how the phenomenon works. I do know that if the experiment is performed as described, it works. What the introduction of additional controls to rule out other cues than the visual would do, I do not know. Anyone who has a group of twenty or more people handy is welcome to try them. I would be interested in their results.

Congratulations, John, to you and your magazine for your efforts in expanding knowledge. My job is reporting said new—and old—knowledge and I am out of practice at acquiring it first hand. ASF is a big help. Also my thanks for many hours of entertaining reading. It may be old-fashioned, but I would rather read a good story that entertains than a too-serious one that merely instructs or exhorts. ASF consistently prints entertaining fiction. That's why I still shell out good money for it.—Charles W. Mustain, 221½ Chestnut Street, Conneaut, Ohio.

It not only takes a group, but a group that is not afraid of the experiment, and conceal that feeling by horseplay.

THE END

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(*Continued from page* 7)
valid, one hundred per cent accurate test for the possession of a sense of ethics. We want men who will do what is right, honorable and ethical, no matter what the laws or the conveniences of the situation say.

We want the test so we can select the men who are fit to be political leaders, judges, major business executives, doctors . . .

A test is devised; we will, for purposes of argument, assert that the Ethics Test is one hundred per cent valid, and does correctly distinguish the ethics-blind from the ethics-seers as accurately as the Ishihara color vision test separates the color-blind from the color seers.

Now a very large proportion of the human race does the right and honorable things because they've been trained to that action as habits—it's a ritual-tabu response that's been indoctrinated. A lion follows the proper way of life for lions not because he uses wise judgment, but because his instincts supply a pattern which he follows.

So far as ethics is concerned, the good-by-ritual people are like blind men in a familiar house. They walk around briskly, avoiding doors, furniture and traps, directing themselves with perfect accuracy to the stairs, and trotting up as spryly as any sighted man. That doesn't mean they're not blind; they still can't pass a test for the ability to see.

Other people are good-by-threat. These are the people who don't steal because the police will punish them; they obey the dictates of society because society is powerful and dangerous. They don't operate on a follow-the-leader basis, but on an obey-the-dictator basis. Their goodness is not brought about by love of God, but by fear of Satan.

These two groups can never supply us with competent leaders; the good-by-ritual will never go beyond the ritual, and the good-by-fear need dictators to supply a fear-source. What we need are those who are ethical because they see the wisdom and satisfaction of it, and can see beyond ritual, and without fear.

If our Ethics Test accurately distinguishes such men from the non-seers of ethics . . . consider the interesting results!

The test will show that the good-by-ritual and the good-by-fear both flunk. And . . . something else.

I've been having fun, recently, asking people to name three of the most famous criminals of all history. I usually get answers of the order of John Dillinger, Jack the Ripper, Hitler, Nero, Judas or Pontius Pilate.

Be it noted that neither Hitler, Judas nor Pontius Pilate was a criminal at all. Hitler wasn't a criminal; he had laws passed that made the things he did legal, and a criminal is, by definition, a lawbreaker. Judas wasn't a criminal; he was a police informer. And Pontius Pilate was acting as the laws of the place and time required, and acting with considerable good judgment. And the others are not *famous,* but infamous.

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The criminals I suggest are Jesus, Galileo, and George Washington. Each was, in fact, guilty of breaking the laws of his place and time.

Note, then, that the good, law-abiding citizens of their place and time would have failed the Ethics Test—and found that widely recognized lawbreakers, criminals, were given high scores!

The ethical giants, moreover, have a natural tendency to rearrange society so that the good-by-ritual are suddenly faced with the fact that their rituals no longer apply. Again, they are like the blind man whose house has suddenly been completely rearranged; he can no longer walk surely and successfully.

The good-by-fear will have less trouble—they're used to being shoved around by brutal, dictatorial, unarguable rulers. It's just a change of one arrogant set of masters for another.

Under the new system, perfectly legal operators like Hitler and Judas and Pontius Pilate would be in trouble.

The vast majority of the human race would, of course, flunk the test; it would, therefore, mean that most men could not hold political office. And nobody who was rejected by the test would ever be able to understand, to perceive, the reality of his failure.

Yet it is quite evident that such an Ethics Test would make for an immense, and rapid improvement in all human society; leadership and power would be placed in the hands of those best fitted to exercise it honestly, honorably, and wisely.

Now: Does anyone have any suggestions as to how to get the test-flunkers—ninety-five per cent of the population—to hand themselves and their affairs over to a tight little clique who claim they have some special, God-given ability?

Accept for the sake of the argument that the Ethics Test is discovered, is real, and works with ninety-nine point nine per cent reliability.

What could be done, even after it had been developed? Only those who passed it could know that the test was real, of course. The others would only know that they were being barred from political, economic, and professional status by an unfair, discriminatory, irrational, meaningless so-called "test."

In a color-blindness test, the color-blind are forced to accept the reality of the test they cannot perceive because the overwhelming majority of people agree that it is real.

In our proposed Ethics Test, the overwhelming majority agree that it is unreal. So then what . . .?

THE EDITOR.

THE END

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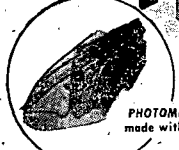

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